201. The Defendants' experts suggest that treasury market liquidity was not improved by the advent of electronic trading on BrokerTec.[200] Their claim is clearly inconsistent with the results of a Federal Reserve Bank of New York study of treasury market liquidity spanning the period 1991-2017.[201]

202. When the Defendants' experts represent the trading costs for treasury futures contracts with the bid-offer spread, and compare this spread with that available through D2C RFQ in the IRS market, they neglect the fact that because the futures market is an all-to-all market, buyside firms are not always paying for liquidity. Instead, buyside firms are sometimes being paid by others for providing liquidity.

203. A New York Fed study of the microstructure of US treasury markets[202] provides evidence that quote providers in CLOB markets for treasuries do not necessarily widen their quotes out of concern they are less informed than those who would take their bids and offers. "The evidence that limit orders also contain value-relevant information suggests that, contrary to the conventional assumption that traders with better information are liquidity demanders (i.e., trade immediately via aggressive orders), they also use limit orders in their trading strategies."

204. Professor Johannes suggests that TRACE post-trade price reporting is publicly available for treasuries transactions.[203] This is not the case.[204]

205. In short, nothing in Professor Johannes' discussion of treasuries trading suggests that AA2A trade of the four classes of standard IRS products at issue here lack viability and buyside benefits.

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[200] Johannes Rep. ¶¶156-161.

[201] See Figures 2 and 4 of Tobias Adrian, Michael Fleming, and Erik Vogt, "An Index of Treasury Market Liquidity: 1991-2017," Federal Reserve Bank of New York Staff Reports, Staff Report No. 827, October 2017, https://www.newyorkfed.org/medialibrary/media/research/staff_reports/sr827.pdf.

[202] Michael Fleming, Bruce Mizrach, and Giang Ngyuen, "The Microstructure of a U.S. Treasury ECN: The BrokerTec Platform," *Journal of Financial Markets*, vol. 40 (2018), pp. 2-22.

[203] Johannes Rep. ¶147.

[204] Minutes of the Meeting of the Treasury Borrowing Advisory Committee of the Securities Industry and Financial Markets Association April 30, May 1, 2019, state that "Debt Manager Taylor provided a summary of primary dealer feedback related to secondary market treasury securities transaction data collected by the Financial Industry Regulatory Authority (FINRA) through its Trade Reporting and Compliance Engine (TRACE). He reminded the Committee that the data is currently provided only to the official sector, and that a potential policy for public dissemination is still being evaluated. At this time, The U.S. Treasury Department is seeking further information on the reporting process and the possibility for data enhancements." https://home.treasury.gov/news/press-releases/sm679.

F. IRS futures: The case of Eris Exchange

206. Dr. Culp asserts, based on data shown in his Table IV-3, that "[t]he fact that the CME's MAC swap futures contracts did not significantly displace the OTC MAC swaps (either for the same or different tenors) is strong evidence against Plaintiffs' experts' opinions that buyside firms would substitute one IRS for another simply because one was available for trading (*i.e.*, CME MAC swap futures) on an AA2A-traded platform."[205]

207. However, when asked "[redacted]"[206]

208. Professor Johannes ascribes the low volume of trade in IRS swap futures offered by the exchange Eris to buyside trading costs.[207] Bid-offer spreads are endogenously determined by the degree of competition for quote provision. At least until recently, there has been low competition for quote provision on Eris. But this goes to the heart of the allegation in this matter, that the Defendant dealers blocked the emergence of anonymous all-to-all trade of IRS.

209. Professor Johannes ignores the alleged conspiracy and thus conflates the actual world with the but-for world. Given the allegation that dealers blocked the emergence of anonymous all-to-all IRS trade, it is not logically correct to use the lack of a quick ramp-up of AA2A trade as evidence of its lack of viability. In fact, there is quite a lot of evidence, including discovery in this case, that is consistent with the incentives of the dealers to block the emergence of Eris.

210. For example, on December 8, 2017, the financial-industry news service *Risk*.net reported: "The bourse [Eris] says it is actively engaged with a large number of real-money clients, several of which it expects to onboard next year. But perhaps the biggest inhibitor to the hockey-stick growth Eris and its backers hanker for are factors outside its control – including a continuing lack of support from some of the largest brokers in the futures business. Names like Barclays, Goldman and JP Morgan are still conspicuous by their

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[205] Culp Rep. ¶254.

[206] [redacted] Dep. Tr. 37:6-12. See also, [redacted] Dep. Tr. 125:21-126:6 [redacted]

[207] Johannes Rep. ¶¶132, 134-136.

absence from Eris's roster of supporting futures commission merchants ("FCMs")."[208] Other examples include the following.

211. [redacted]

212. In his deposition in this matter, [redacted][210]

213. [redacted][211]

214. In his deposition in this matter, [redacted][212]

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[208] "Exchange innovation of the year: Eris Exchange," *Risk*, December 8, 2017,

[209] [redacted] Dep. Tr. 181:9-182:3.

[210] [redacted] Dep. Tr. 174:10-175:15.

[211] [redacted]

[212] [redacted] Dep. Tr. 137:24-138:23) [redacted] Dep. Tr. 139:25-140:11 [redacted]

215. [redacted][213]

216. [redacted][214]

217. [redacted]

[redacted][215]

218. Based on the evidence, major market participants clearly did not agree with the proposition since put forward by Professor Johannes that swap futures trading on Eris had dim prospects.

[redacted] *see also* Exhibit 5405, [redacted], at '197.

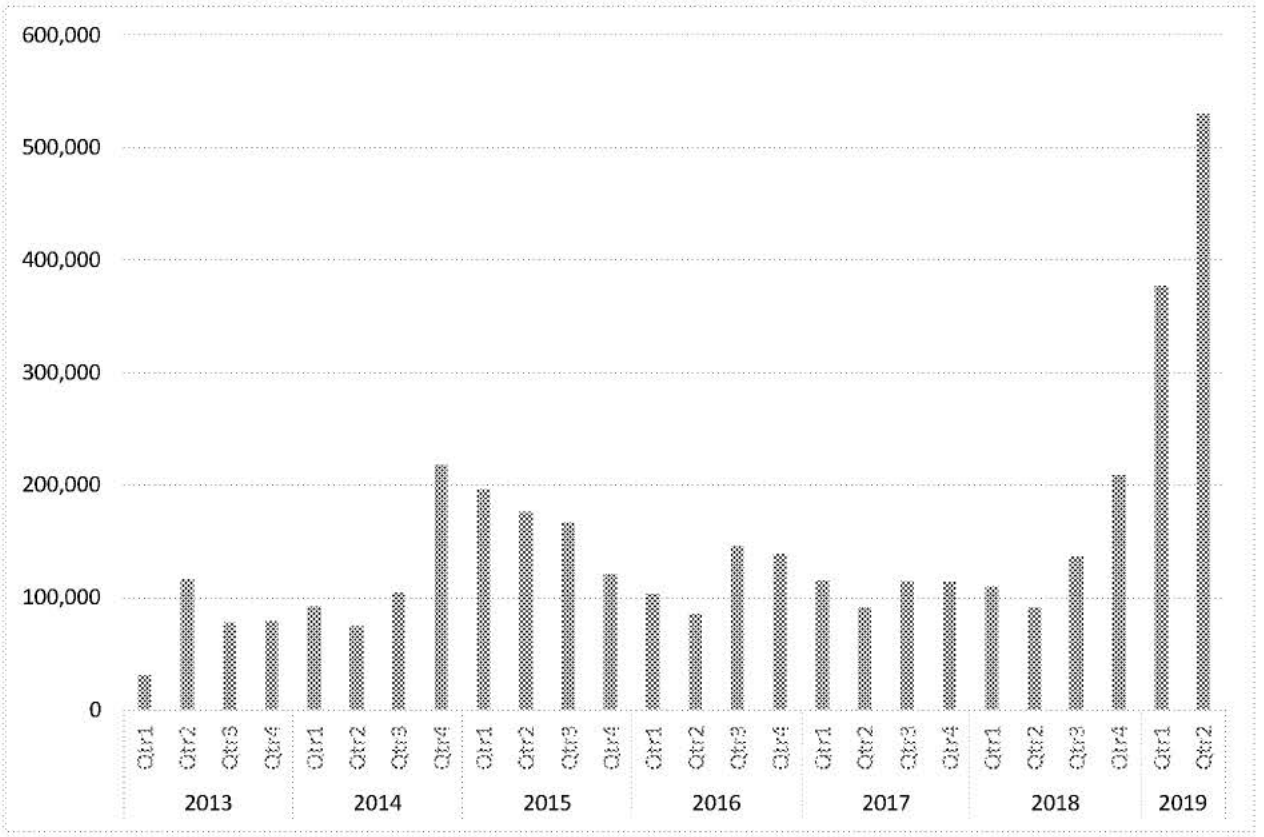
213 [redacted] at '397.

214 [redacted]

215 [redacted]

219. In 2019, Eris volume increased dramatically, as shown in Figure 3,[216] negating the suggestion that AA2A trade of IRS futures is not viable or attractive to buyside firms.

Figure 3. Total volume of Eris USD Swap Futures contracts traded per quarter
Includes all tenors of Eris Standard and Eris Flex. Data source: Eris.



IV. SUBSTANTIAL AA2A TRADE OF IRS WOULD HAVE OCCURRED BY 2013

220. Based on the evidence that I provide here and in my opening report, absent the alleged blocking actions of dealers, there would have been active AA2A trade by the beginning of 2012 of a range of types within each the four classes of standardized IRS products at issue, on one or more of the platforms I discuss later in this section. These platforms include Javelin, Tera, and trueEX. I have also seen evidence that Bloomberg, and two

[216] Eris volume provided by Geoffrey Sharp (Eris Innovations, Managing Director, Head of Sales), August 1, 2019. Filename: Historical Volume Open Interest Pre& Post CME.xlsx. Until recently, there were two types of Eris USD futures contracts – Eris Standard and Eris Flex. Eris Flex began to be phased out in the second quarter of 2015. Eris Flex's open interest went to zero on November 26, 2018. Today, Eris Standard are simply Eris USD Futures. Eris daily volume (Standard and Flex combined) and daily open interest (Standard and Flex are not combined) are as received from Eris. Each contract has a notional value of $100,000. The tenors for Eris USD Futures contracts are: 2, 3, 4, 5, 7, 10, 12, 15, 20, and 30 years. The data, as received, are not broken down by tenor.

IDB platforms (ICAP/i-Swap and Tradition/Trad-X) were also capable of offering AA2A trading options prior to 2013.

221. In the but-for world, as a consequence of the active AA2A trade of benchmark IRS and the other IRS product types of concern, all or nearly all buyside firms would have benefited from (i) better pricing for their trades on anonymous all-to-all venues, (ii) better pricing on trades of the same and related products that they conducted by RFQ with dealers, through the effect of improved price discipline on dealer quotes and lower dealer inventory management costs, (iii) profits from their provision of quotes on anonymous all-to-all venues, and (iv) lower operational costs.

222. Professor Johannes' report does not express an opinion concerning which IRS products would have traded on anonymous all-to-all venues in the but-for world, but he makes various claims regarding the lack of trading interest by, or value to, buyside firms for AA2A trade of IRS products. I addressed Professor Johannes' concerns in Section II of this report, and I will return to some of these later in this section.

223. In both his report[217] and his deposition,[218] Dr. Culp states that some benchmark IRS are indeed suitable for anonymous all-to-all trade. However, when judging that other benchmark swaps and other IRS products would not be suitable for anonymous all-to-all trade, Dr. Culp stated in his deposition that he did not account for the impact of alleged dealer blocking behavior on the data that he used for his viability analysis.[219]

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[217] Culp Rep. ¶24 ("Based on my analysis, it is my opinion that only a limited subset of standardized 'benchmark' IRS potentially may have had enough demand and liquidity to trade at bid-ask spreads on AA2A platforms that were more favorable (or at least as favorable) than those available via RFQ or voice during the Class period."); Culp Rep. ¶119 ("I conclude that only certain whole tenor IRS products – all of which are a subset of the 'benchmark' IRS that Prof. Duffie maintains are suitable for AA2A trading – are both sufficiently standardized and likely sufficiently liquid to be potentially suitable for AA2A trading."); Culp Rep. ¶158 ("Based on this analysis, I conclude that only a few whole tenor benchmark IRS had sufficient liquidity during the period from February 2014 through December 2017 to have potentially supported CLOB trading at comparable or more favorable bid-ask spreads than were available to buy-side IRS customers during that period using RFQ or voice execution."); Culp Rep. ¶190 ("The empirical analysis presented in this section and summarized in Tables III-8 and III-9 indicates that only a small subset of whole-tenor fixed/float benchmark IRS (and no basis swaps) had sufficient average daily notional trading volumes during the Suggested Class Period to have been potentially suitable for CLOB trading.").

[218] Culp Dep. Tr. 321:2-7 ("Well, if I hadn't included the interdealer D2D market as part of the available liquidity for potential all-to-all trading in my suitability test, then literally nothing would have been remotely close to liquid enough to survive an all-to-all environment."); Culp Dep. Tr. 366:17-367:4 ("Q. But your conclusion here is that MAC swaps lacks sufficient liquidity and demand during the suggested class period to be suitable for trading on a CLOB, right? A. That's true. Because, as I just mentioned, they're very standardized and therefore satisfy the first prong of my suitability test which is standardization and clearability, but the actual trading activity in MAC swaps is really quite small and would be nowhere near the minimum liquidity thresholds just taken as a product class on its own.").

[219] Culp Dep. Tr. 81:5-82:7, 92:6-94:13, 95:2-8, 229:15-25, 231:15-234:16, 332:2-333:14, 362:25-363:14.

224. For example, at one point in his deposition, Dr. Culp said that "any analysis of volume relative and absolute in the but-for world of MAC swap activity necessarily requires an assumption about what the amount of trading would have been. And you can make any assumption. It's forward looking. It's a prediction. It's speculative. I thought that using the actual data was the most reasonable assumption to make." [220]

225. At another point in his deposition, Dr. Culp stated that he relied on data from the actual world as though representative of the but-for world because he assumed that the alleged dealer blocking behavior had ceased by the time that the data were generated. He said: "I don't think I ever explicitly accepted that there was any blocking going on, I simply analyzed the world in which had there been blocking of access to AA2A, it was no longer going on. In other words, I didn't evaluate the merits of the allegations."[221]

226. At another point, in answer to the question "Did you consider whether in the but-for world without the alleged conspiracy there might be more liquidity on those platforms or not?" Dr. Culp said, "I thought about it, but there's sort of no way to conduct that analysis, so I didn't consider it in a way that it affected my analysis or opinions."[222]

227. And at another point: "Q. Okay. But you took this data from the actual world as a proxy for what would have happened in a world without that conspiracy, correct? A. … The statement as you put it is correct, this is based on real world data. Q. And none of this data reflects any anonymous all-to-all trading, correct? A. That's right."[223]

228. In his analysis of the viability of anonymous all-to-all IRS trade, Dr. Culp failed to consider that alleged dealer behavior would suppress actual-world observed trade activity. Because of that failure, he understated or ignored the implications of the alleged blocking behavior of the dealers for the viability of AA2A trade of additional benchmark IRS and other IRS products. Logically, that is, the greater the success of the alleged dealer conspiracy at blocking viable anonymous all-to-all trade, the more convinced Dr. Culp would have been, based on his methodology, that there had been no such conspiracy and that anonymous all-to-all trade was not viable.

229. Professor Johannes admitted in his deposition in this matter that his opinion that the Plaintiffs cannot explain why customers have not increased trading on anonymous all-to-all platforms is based on his presumption that the conspiracy ended with the filing of this case: "I'm presuming here it ceased."[224]

230. In general, the Defendants' experts' arguments against the viability and buyside benefits of all-to-all trade of the IRS product types of concern are based on their observations of

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[220] Culp Dep. Tr. 232:8-16.

[221] Culp Dep. Tr. 92:6-23.

[222] Culp Dep. Tr. 363:7-363:14.

[223] Culp Dep. Tr. 333:6-14.

[224] Johannes Dep. Tr. 239:11-241:2.

the IRS market during periods over which the alleged dealer blocking of AA2A trade occurred, without taking into account the impact of the alleged blocking behavior on trading activity, the timing of AA2A platform preparedness, and bid-offer spreads.

231. The record evidence that I presented in Section II of this report and in my opening report shows that buyside firms desired the ability to trade on anonymous all-to-all platforms, but dealer liquidity to these platforms was lacking, despite the first-mover advantage for individual dealers to provide liquidity. The evidence that I presented also shows that dealers were concerned about the threat that anonymous all-to-all trade posed to their businesses. The dealers' collective incentive to protect their existing businesses by failing to provide liquidity to anonymous all-to-all venues is consistent with the alleged collusion. In the remainder of this section, I catalogue some of the significant record evidence that (i) consistent with my opinions concerning viability stated in my opening report, trade platforms had the technology for anonymous all-to-all trade of IRS products in the actual world by 2013 and that (ii) in the but-for world, anonymous all-to-all trade of IRS was viable and would have been well under way in 2012. The bulk of the transition to anonymous all-to-all trade would have been phased in over the following months.

A. Trade of the IRS products at issue was sufficiently active for AA2A trade

232. As I stated in my opening report, in the but-for world, the key criteria for the viability of anonymous all-to-all trade is sufficient amount and breadth of trade activity to give platform operators an incentive to introduce anonymous all-to-all trade. Standardization, central clearing, and technology issues were not roadblocks. My opening report discusses these issues in detail and concludes that, absent the alleged blocking by dealers, there was indeed sufficient volume of trade and breadth of participation by market participants for AA2A of many IRS product types.

233. As Dr. Culp agreed in his deposition and report, even in the actual world there was sufficient trade activity for anonymous all-to-all trade of some benchmark IRS.[225] In the but-for world, there would have been much greater trade volumes and breadth of participation, because anonymous all-to-all trade increases competition for quote provision and heightens the intensity of pre-trade price transparency. These but-for-world accelerants were not considered by Dr. Culp, who relied on actual-world activity to judge viability. In the but-for world, the availability of AA2A trade would cause bid-offer spreads and price impacts to contract, which increases volumes of trade and the entry of market participants onto these platforms, because they can now trade at lower cost. This entry further increases trade activity and competition for quote provision, a positive feedback effect explained in more detail in my opening report, with examples.[226]

[225] Culp Dep. Tr. 254:15-24; Culp Rep. ¶167.

[226] Duffie Rep. ¶¶129-142.

234. As an example of the level and breadth of activity generated by AA2A trade, volume in exchange-traded CME treasury futures in 2018 averaged $477 billion per day.[227] Participation by large buyside firms was extremely broad. On October 2018, the number of large position holders reached 1,622, according to CME.[228] The total number of position holders is much higher.

235. On Eurex, exchange-traded German government 10-year bond ("bund") futures[229] have a total monthly volume of over 1.5 trillion euros. Volumes of over-the-counter trade of German government bonds with dealers is an order of magnitude smaller, according to data from the German government's debt management bureau that I cited in Section II.G. of this report.[230]

236. BrokerTec is by far the most active OTC trade platform for treasuries. Its setup, however, makes direct buyside central clearing difficult, as I discussed in Paragraphs 186-190. So, compared to CME, BrokerTec has lower total volume and breadth of participation, with essentially no buyside firms other than principal trading firms. Total BrokerTec volume in comparable maturities has been running at approximately $100 billion per day in recent years.[231] In 2014, the total number of participants on BrokerTec and eSpeed (the second largest platform for treasuries), combined, was less than 100. The bulk of BrokerTec participation was made up of 44 dealers and 37 principal trading firms,[232] for a total number of large participants that is far below the number of large position holders of CME's exchange-traded treasuries futures.

237. The total number of participants in the interest rate swap market is more than enough to support anonymous all-to-all trade of the IRS instruments at issue. For example, an

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[227] "Welcome to U.S. Treasury Futures," CME Group, 2019, https://www.cmegroup.com/trading/why-futures/welcome-to-us-treasury-futures.html.

[228] "Interest Rate Futures Liquidity – 2018," CME Group, January 7, 2019, https://www.cmegroup.com/education/featured-reports/interest-rate-futures-liquidity-update.html.

[229] Eurex Monthly Statistics, Eurex, August 2019, https://www.eurexchange.com/resource/blob/1621236/866efbb83183353f95efa51422261a9e/data/monthlystat_201908.pdf.

[230] "Secondary Market," Federal Republic of Germany Finance Agency, 2019, https://www.deutsche-finanzagentur.de/en/institutional-investors/secondary-market/.

[231] See Figure 1 of Tobias Adrian, Michael Fleming, and Erik Vogt, "An Index of Treasury Market Liquidity: 1991-2017," Federal Reserve Bank of New York Staff Reports, Staff Report No. 827, October 2017. https://www.newyorkfed.org/medialibrary/media/research/staff_reports/sr827.pdf; Michael Fleming, Bruce Mizrach, and Giang Ngyuen, "The Microstructure of a U.S. Treasury ECN: The BrokerTec Platform," *Journal of Financial Markets*, vol. 40 (2018), pp. 2-22.

[232] Joint Staff Report, "The U.S. Treasury Market on October 15, 2014," U.S. Department of the Treasury, Board of Governors of the Federal Reserve System, Federal Reserve Bank of New York, U.S. Securities and Exchange Commission, and U.S. Commodity Futures Trading Commission, July 13, 2015, p. 22, https://www.sec.gov/files/treasury-market-volatility-10-14-2014-joint-report.pdf.

official EU study[233] of the European swap market showed, after a careful culling of potential duplicates, that the market for plain-vanilla euro IRS (6-month fixed-for-floating, Euribor) included 5,969 distinct market participants. I am not aware of a similar study for the USD swap market, which I expect would have a similarly large number of participants. This high level of participation applied even in the actual world, before considering the impact on breadth of participation associated with the advent of exchange trade of some IRS products. The evidence therefore runs counter to Professor Johannes' suggestion that IRS are not suitable for all-to-all trade because the IRS market is only of interest to large "institutional" market participants.[234] In the but-for world, the advent of anonymous all-to-all trade would have brought in participation from many additional buyside firms, including PTFs and many medium-sized and even retail investors (of the type that trade Eurodollar futures) for those IRS products that would become actively traded on exchange CLOBs.

238. As support for his claimed unsuitability of IRS for retail and individual investors, Professor Johannes cites Section 723(a)2(e) of the Dodd-Frank Act. However, Professor Johannes misunderstood this provision. Section 723(a)2(e) only restricts trading *on SEFs* to Eligible Contract Participants. The Dodd-Frank Act clearly allows AA2A trade of IRS and other swaps on designated contract markets ("DCMs"). DCMs routinely offer trading services to large institutional investors and to individual and retail investors, including investors who are not eligible contract participants.[235]

239. In fact, trueEX, always operated its IRS CLOB as a DCM.[236] In its letter to the CFTC regarding DCM registration, trueEX wrote:

> *"Through discussions with prospective market participants, trueEX has found that there is great demand for trueEX to be able to allow intermediated trading upon launch (if possible) or soon thereafter,*

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[233] Jorge Abad, Iñaki Aldasoro, Christoph Aymanns, Marco D'Errico, Linda Fache Rousová, Peter Hoffmann, Sam Langfield, Martin Neychev, and Tarik Roukny, "Shedding Light on Dark Markets: First Insights from the New EU-Wide Derivatives Dataset," European Systemic Risk Board, Occasional Paper Series No. 11, September 2016, https://www.esrb.europa.eu/pub/pdf/occasional/20160922_occasional_paper_11.en.pdf.

[234] Johannes Rep. ¶¶31, 64-65.

[235] "Process for a Designated Contract Market or Swap Execution Facility to Make a Swap Available to Trade under Section 2(h)(8) of the Commodity Exchange Act," CFTC, Office of Public Affairs, https://www.cftc.gov/sites/default/files/idc/groups/public/@newsroom/documents/file/mat_factsheet_final.pdf.

[236] trueEX LLC Rulebook, December 3, 2015, p. 3 ("The DCM Trading System consists of an anonymous central limit order book"), p. 46 ("The SEF Trading System provides RFQ functionality as a method of execution through two different applications: Core RFQ and PTC."); "Platform," trueEX, 2019, https://www.trueex.com/platform#products ("The trueEX Designated Contract Market (DCM) supports standardized USD and EUR products. These products include SIFMA Market Agreed Coupon (MAC) contracts tradable in an anonymous CLOB format (CLOB).").

> *especially in the context of hedge fund managers and asset managers to be able to place orders on behalf of funds and clients for which they are trading on a discretionary basis, and ultimately for buy-side firms who prefer to place orders in a more traditional manner by having a broker act on their behalf. As such, allowing intermediation will open up the market to a much larger pool of market participants than if access was limited only to those trading on a proprietary basis."*[237]

240. That AA2A trade of IRS products was viable, absent the alleged conspiracy, is revealed by the significant commitment of capital to this enterprise by entrant platform operators. For example, in his deposition,[238] Sunil Hirani testified that [redacted] in trueEX, and that the total capital invested in trueEX was about $100 million, of which the bulk was equity. Further evidence of this commitment of capital to trueEX is provided in the Declaration of Mr. Hirani.[239] This suggests significant conviction by an expert in derivatives trading platforms[240] that AA2A of IRS was viable, as I emphasized in my deposition.[241]

241. Dr. Culp shows a concern about the cost to buyside firms of exiting IRS positions, if entered by anonymous all-to-all trade, due to the potential for reductions in trade activity over the lifecycle of an IRS product, that could later become less actively traded. He wrote that "A major historical appeal of standardized futures contracts is the ease with which they enable a market participant both to enter and exit positions. Given the nature of IRS products, however, the ability of buy-side IRS participants to enter into offsetting

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[237] Letter from Fran Kenck (trueEX, Chief Regulatory Officer) to Ms. Sauntia Warfield, (CFTC, Office of the Secretariat), re: Notification that trueEX LLC intends to offer intermediation (trueEX LLC submission #2013-01), January 14, 2013, https://www.cftc.gov/sites/default/files/stellent/groups/public/@otherif/documents/ifdocs/truexnotification011413.pdf.

[238] Hirani Dep. Tr. 467:16-468:17 ("[redacted] Q. Do you know how much money TrueEx has raised in its history? A. I believe it's around 100 million plus. Q. And is that $100 million in equity? A. I believe it's mostly in equity, although I think there's maybe 12-ish million in debt. Q. Does that debt exist today? A. It does. Q. Who is the debt holder on that? A. I have some of it and some of the other shareholders have some of the others.").

[239] Hirani Decl. ¶13.

[240] Before founding trueEX, Mr. Hirani worked in sales, marketing, and structuring of interest rate swaps and credit default swaps at Bankers Trust and Deutsche Bank. He later founded Creditex, an electronic interdealer platform for trading credit default swaps, Tzero, and LoanX. Creditex and Tzero were sold to Intercontinental Exchange and LoanX was sold to Markit. Hirani Dep. Tr. 17:9-18:21, 21:11-25, 23:9-18; [redacted], p. 10. *See also* Hirani Decl. ¶¶2-9, regarding Hirani's professional background and financial derivatives experience.

[241] Duffie Dep. Tr. 138:5-16.

trades to exit an open position – i.e., unwinding an existing position by executing an offsetting but otherwise-identical trade cleared by the same CCP as the original trade – is limited because IRS products are not 'fungible' (i.e., identical and replaceable) in the same way that futures contracts are."[242]

242. I disagree with Dr. Culp. Trade costs for exiting swap positions would in many cases be lower on anonymous all-to-all venues than via D2C RFQ, given the trading-cost efficiencies of all-to-all trade competition and price transparency that I have detailed. For situations in which exit trade costs are nevertheless lower via a D2C RFQ trade, that option remains available in the but-for world. Nothing is taken away by the presence of anonymous all-to-all trade. One "bite of the apple," by AA2A trade at the inception of an IRS position, is better than no bites of the apple. This is essentially what happens currently in the D2D market for treasuries. When treasury notes are first issued, they are traded on all-to-all (among dealer) platforms using CLOB and workup protocols. Once an on-the-run treasury note goes off the run after some months, trade among dealers of the same treasury note becomes thinner and is no longer based on all-to-all (among dealer) protocols.

243. In the market for some IRS products, compression trade would also be available to some buyside firms as way to exit positions that they would have been entered in the but-for world with AA2A trades. Moreover, MAC swaps, because of their standardized (IMM) maturity dates and standardized coupon rates, retain significant fungibility over time with new MAC swaps, thus facilitating exit via anonymous all-to-all trade.

244. The Defendants' experts also assert that some IRS products are not standardized enough to trade on AA2A platforms. In fact, a wide variety of IRS products are standardized under ISDA contract language, including all actively traded types among the four IRS product classes of concern in this matter. The high degree of standardization of these four IRS products is described in my opening report.[243] I also detail in my opening report that all of these ISDA-standardized IRS product classes are operationally ready for straight-through processing on AA2A platforms. Among these standardized IRS products, many would have traded on AA2A platforms in the but-for world, and many would not have. The decision of which IRS product types to list for AA2A trade would have been made by trade platform operators based on their projections of platform fee revenues stemming from the trading demands of market participants, absent alleged dealer blocking. Buyside prices for IRS products that were not offered on AA2A venues would have been disciplined by the existence of AA2A trade for related products, as I have explained.

245. Dr. Culp finds over 8,700 different types of IRS[244] and concludes that: "A product with over 8,700 variations cannot be considered standardized even if it may have been technologically possible to list every variation on a CLOB." Standardization is a separate issue from the heterogeneity of specific contract terms, which seems to be the actual

[242] Culp Rep. ¶143.

[243] Duffie Rep. ¶54, Section VI.C.

[244] Culp Rep. ¶134.

premise of Dr. Culp's remarks on "standardization." As Dr. Culp suggests, there is a high degree of diversity of terms among IRS. For plain-vanilla IRS, the contracts are completely determined and unambiguous once the counterparties fill in completely standard ISDA terms such as currency, notional amount, maturity date, and fixed rate. As an illustrative metaphor, the Celsius temperature scale is completely standardized. Everyone reporting temperatures on this scale treats 20 degrees Celsius in exactly the same way, but there is no single "standard temperature." There are many different Celsius temperatures.

246. It is incorrect to conclude from the fact that there is a large number of types of IRS that these contracts are not standardized. [redacted][245] [redacted]

247. Moreover, the existence of a large number of types of a financial instrument is consistent with the viability of AA2A trade of a large subset of them, far more even than the number of IRS types that Dr. Culp identifies. For example, my review of CBOE trade data from September 6, 2019 finds 462,522 unique types of exchange-traded equity option contracts with positive open interest.[246] Many of these were frequently traded and many were infrequently traded, as I illustrated in the figure on page 22 of my opening report.[247]

248. Dr. Culp's report suggests that exchange trading is not "suitable" for contract types with low trade volumes. In his deposition, Dr. Culp stated that he created his own definition of "suitability" for this purpose.[248] His conclusion is directly belied by the real-world evidence that I described above. Exchanges frequently list low-volume products, and market participants do trade these products on exchanges. Paragraphs 157 and 161 of Dr. Culp's report are internally inconsistent in this respect. There, Dr. Culp points to the

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[245] [redacted], p. 6

[246] End-of-Day Option Quotes Data, CBOE DataShop, September 6, 2019, CBOE Underlying Options EODQ_2019-09-06.csv, https://datashop.cboe.com/.

[247] Duffie Rep. p. 22.

[248] Culp Dep. Tr. 81:5-82:7. "Q. How did you go about trying to determine what the world would have looked like in the absence of the alleged conspiracy? A. Well, for the purpose of this bullet, again, I assumed the plaintiffs and their experts' but-for world is a world in which there was nothing related to dealers and their alleged conduct that would have prevented customers from accessing interest rate swap products on an AA2A platform. And so I stepped back and said, setting aside the alleged behavior of the defendants, when is a product appropriate and suitable for trading on an AA2 platform. And I then defined suitability in the context of this case as, number one, sufficient standardization and clearability. And number two, sufficient liquidity to support effective -- not effective -- to support spreads that would be no worse or even more favorable than spreads for the same products executed through an alternative non-AA2A trading mechanism. In other words, I define a product as unsuitable if it's either not sufficiently standardized or if it's not sufficiently liquid with enough frequent and sizable trading activity to support spreads that would have been an improvement over, let's say, RFQ-3 for the same product."

existence of Eurodollar futures contracts that actually trade on CME's CLOB with low volumes as evidence that low-volume products are not suitable for CLOB trade!

249. In the but-for world, there would be high volumes of AA2A trade in benchmark IRS, among other popular types of IRS products, medium volumes of AA2A trade for some other IRS products, and successively lower volumes of AA2A trade of many other types of IRS, just as is the case for CBOE options and Eurodollar futures. Sufficiently thinly traded IRS products would not have been available for trade on AA2A platforms. I explained in my opening report that when there is high trade activity in some products, anonymous all-to-all venues can support AA2A trade in lower-volume related contracts. Professor Johannes' report does not offer a rebuttal to this point in my opening report, which I illustrated with cases of high-volume and low-volume equity options and Eurodollar futures.[249]

250. Total CME volume in Eurodollar futures in 2018 averaged over $3 trillion per day. I do not believe that CME is acting against its own commercial interest by listing high-volume and low-volume futures contracts at the same venue. CME is qualified to make that business decision appropriately. Similarly, once anonymous all-to-all trade of benchmark IRS had traded actively in the but-for world, platform operators would have offered anonymous all-to-all exchange services for highly active traded and less actively traded IRS products.

B. Benchmark IRS would have had active AA2A CLOB trade by early 2012

251. In the next two sub-sections I explain and provide support for the likely order in which IRS products would have migrated to AA2A platforms in the but-for world.

252. Benchmark IRS are obvious candidates for the first phase of anonymous all-to-all trade. [redacted][250] As I wrote in paragraph 94 of my opening report, economists at the Federal Reserve Bank of New York conducted a study[251] of the composition of trading activity in OTC interest-rate derivatives in mid-2010, finding that "[t]he IRD market also displayed a concentration of trade activity in particular tenors, with almost 60% of the transactions in the top products and currencies occurring in a small number of benchmark instruments" and that "IRS displayed elevated activity at tenors reflecting liquid sovereign issuance points. Spot trading in 2-, 3-, 5-, 10- and 30-year swaps represented around 57% of the

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[249] Duffie Rep. ¶¶73-77 and figure following ¶¶74 and 80.

[250] [redacted], p. 6.

[251] Michael Fleming, John Jackson, Ada Li, Asani Sarkar, and Patricia Zobel, "An Analysis of OTC Interest Rate Derivative Transactions: Implications for Public Reporting," Federal Reserve Bank of New York Staff Reports, Staff Report No. 557 (March 2012; revised October 2012), pp. 3, 13, https://www.newyorkfed.org/medialibrary/media/research/staff_reports/sr557.pdf.

G4 IRS activity and 46% of the notional volume." Here, "G4" refers to the four major currencies (US dollars, Euros, British pounds, and Japanese Yen).[252]

253. The high likelihood that benchmark IRS would have started the migration of IRS onto AA2A trade was well recognized at the time. In a November 2013 letter to the SEC and CFTC, the Managed Fund Association[253] (MFA) expected "ample streaming liquidity" for all-to-all order-book trade of benchmark IRS. The MFA wrote: "The most commonly traded IRS are outright spot-starting swaps traded on the benchmark points of the swap yield curve ("Benchmark Swaps"). In the U.S., these benchmark points are the 1-yr., 2-yr., 3-yr., 5-yr., 7-yr., 10-yr., 15-yr., 20-yr., and 30-yr. points. Swap trading data demonstrates that the vast majority of trading activity is concentrated at these benchmark points. [footnote omitted.] In addition, buy-side market participants currently observe live indicative and/or firm quotes from dealers (e.g., BBTI page on BSEF) at these benchmark points. Thus, we expect to see ample streaming liquidity provided in SEF/DCM order books for Benchmark Swaps."[254] In the but-for world, the AA2A trade of these benchmark IRS would have started much earlier than 2013, given the absence of the alleged blocking by dealers.

254. At page 55 to 56 of his report, Dr. Culp points to the fact that, of benchmark IRS, five tenors alone account for 66% percent of total volume of trade.[255] When he emphasizes that trade is highly concentrated in these tenors, even in the actual world, he makes this point as an argument that there is not much activity in many other tenors.[256] Instead, this fact is evidence that these five benchmark tenors are actively traded, thus among the obvious candidates to include in the first phase of migration to AA2A. [redacted][257] In the but-for world, the number of tenors that would be actively traded on AA2A venues would be significantly greater. The MFA appropriately enumerates nine such benchmark tenors, even for the first phase of AA2A trade, and even in the actual world.

255. Other tenors and other IRS products would quickly have followed the initial migration to AA2A trade. In the meantime, AA2A of benchmark IRS would cause buyside firms to benefit from the associated discipline on dealer quotes for swaps of other tenors and other

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[252] Michael Fleming, John Jackson, Ada Li, Asani Sarkar, and Patricia Zobel, "An Analysis of OTC Interest Rate Derivative Transactions: Implications for Public Reporting," Federal Reserve Bank of New York Staff Reports, Staff Report No. 557 (March 2012; revised October 2012), p. 8, https://www.newyorkfed.org/medialibrary/media/research/staff_reports/sr557.pdf.

[253] Managed Funds Association Submission to CFTC, Re: Industry Filings IF 13-004, 13-005, and 13-007, November 21, 2013, https://comments.cftc.gov/PublicComments/ViewComment.aspx?id=59381.

[254] Managed Funds Association Submission to CFTC, Re: Industry Filings IF 13-004, 13-005, and 13-007, November 21, 2013, https://comments.cftc.gov/PublicComments/ViewComment.aspx?id=59381.

[255] Culp Rep. ¶141.

[256] Culp Rep. ¶¶141-142.

[257] [redacted], at '777.

IRS products. As I have explained, buyside firms always have the option, before and after the availability of AA2A trade of any product, to conduct D2C RFQ trade of the same products.

C. Phase-in of active AA2A trade of additional IRS products

256. In the but-for world, not all IRS products that would have eventually traded on AA2A venues would have been introduced onto these venues at the same time. Rather, soon after liquidity and trade activity had built up for AA2A trade of US dollar (USD) and euro (EUR) benchmark IRS and MAC swaps, platform operators would have phased in AA2A trade of lower-volume IRS products. As I explained in the previous section, in the context of listing decisions by CBOE of equity options and by CME of Eurodollar futures, highly active exchange trade of some products supports less active trade of similar lower-volume products on the same exchange.

257. This phase-in "snowballing" of the migration of trade to AA2A platforms is consistent with the views expressed to the CFTC by the MFA.[258] The MFA proposal addressed the phasing in of CFTC made-available-for trade (MAT) designations, for the trade of IRS products on SEFs or DCMs. The MFA's phase-in schedule is consistent with my opinions regarding the order in which various specific types of additional IRS products would have achieved active AA2A trade in the but-for world, and the time lags between their respective introductions.

258. Given the alleged blocking by dealers, AA2A trade would, however, have been much earlier and more active in the but-for world than was the case in the actual world for the "SEF/DCM" MAT designations contemplated by the MFA. The order of IRS product types and the times between phases of product migration to AA2A trade platforms would, in my opinion, have been based in the but-for world on similar supporting economic conditions and reasoning.

259. Within several months after active anonymous all-to-all trade of USD and EUR benchmark and MAC swaps, there would have been active AA2A trade of some non-benchmark whole-tenor USD and EUR par-coupon spot-starting swaps, as well as some USD and EUR basis swaps and OIS in benchmark tenors. The liquidity and trade activity of these additional IRS products, along with previously introduced benchmark and MAC swaps, would have built up for another several months, by which time platform operators would have introduced additional IRS products for anonymous all-to-all trade. The MFA schedule for the introduction of SEF/DCM trade is again a reasonable guide to the phasing in of anonymous all-to-all trade of additional IRS products, and shows in subsequent rounds over the next six months the phasing in of benchmark forward-starting USD and EUR par-coupon swaps, benchmark British Pound (GBP) IRS, some basis

[258] Managed Funds Association Submission to CFTC, Re: Industry Filings IF 13-004, 13-005, and 13-007, November 21, 2013, https://comments.cftc.gov/PublicComments/ViewComment.aspx?id=59381.

swaps and OIS that are non-benchmark whole-tenor USD and benchmark GBP, some partial tenor EUR and IRS swaps, and some FRAs.

260. The MFA's letter[259] states: "Drawing parallels to the U.S. government bond market and the corporate credit market, Benchmark Swaps share similar trading features to on-the-run treasuries and current series index credit default swaps… Within their respective markets, such instruments are used by market participants as primary risk transfer instruments and are often the most liquid, offering consistently observable measures of market levels. In contrast, across all of these markets, the non-benchmark issues trade with significantly less frequency and liquidity than the benchmark issues. Thus, we do not expect, at least initially, to see streaming order book liquidity in non-benchmark whole tenors." I agree with the MFA's reasoning, which would likely have applied to some extent even in the but-for world. However, as explained above, I believe even non-benchmark whole tenors, and other products that are relatively less liquid in the actual world, would have benefited from AA2A trade, and many ultimately could have traded on AA2A platforms.

261. Consistent with the discussion by the MFA of SEF/DCM trade of other IRS products, while I expect that USD and EUR benchmark whole-tenor IRS and MAC swaps would have initially been offered and actively traded on CLOBs, the anonymous all-to-all trade of other classes of IRS product types (FRAs, OIS, and single-currency basis swaps) could have initially been conducted using other AA2A protocols, such as all-to-all RFQ.

262. While some types of plain-vanilla IRS, FRAs, OIS, and single-currency basis swaps would not have achieved sufficient levels and breadth of trade activity to cause platform operators to launch them for AA2A trade, buyside firms would nevertheless have benefited in their trades of these IRS products through the price discipline on dealer quotes associated with the existence of AA2A trade of related IRS products. This discipline on dealer quotes is caused by price transparency stemming from AA2A trade of related IRS products and by the option to substitute with related AA2A-traded products or baskets of products. Price discipline increases with the degree to which there are related AA2A-traded products, or related baskets of AA2A-traded products. The economic principles of this price discipline on dealer quotes are explained in my opening report and elsewhere in this reply report.

263. For example, the price disciplining of dealer quotes for non-AA2A trades of some types of FRAs is implied by the existence AA2A trade of the same or closely related FRAs. Moreover, the fair pricing of FRAs is largely explained by the term structure of rates for plain-vanilla IRS. Thus, dealer quotes on FRAs are also disciplined by AA2A trade of benchmark and other IRS.

[259] Managed Funds Association Submission to CFTC, Re: Industry Filings IF 13-004, 13-005, and 13-007, November 21, 2013, https://comments.cftc.gov/PublicComments/ViewComment.aspx?id=59381.

264. Similarly, dealer quotes for standardized OIS that are not available for AA2A trade would be disciplined in the but-for world by price transparency and substitution options stemming from AA2A trade of related OIS.

265. Dealer quotes for standardized single-currency basis swaps are likewise disciplined by price transparency and substitution options associated with AA2A trade of related single-currency basis swaps. Many single-currency basis swaps are economically equivalent to the exchange of an OIS for a plain-vanilla IRS, or the exchange of two different LIBOR interest rate swaps (such as 3-month LIBOR versus 6-month LIBOR). Thus, the price disciplining of single-currency basis swaps is enhanced by the existence of AA2A trade of OIS and IRS with the same or similar maturities.

D. There would have been early and active AA2A trade of MAC swaps

266. MAC swaps are a primary example of an IRS product that would have migrated quickly to AA2A trade. This is so because MAC swaps are specifically designed to concentrate IRS trade demand across a relatively wide range of potential types into a relatively small set of fungible product types. This is accomplished with a design based on standardized IMM quarterly maturity dates and fixed-side quarterly coupon rates. Price compensation is based on upfront payments rather than by adjusting the fixed-side coupon rates.

267. In the but-for world, I believe that US dollar and euro MAC swaps would have been liquidly traded on anonymous all-to-all venues at around the same time as this occurred for corresponding benchmark IRS. This is consistent with the timing for SEF/DCM trade suggested by MFA.[260]

268. Even in the actual world, moderately active CLOB trade of MAC swaps eventually occurred on CME.[261] This clarifies that the Defendant-expert suggestions that MAC swaps are not suitable for AA2A trade are not correct.

269. [redacted][262]

[260] Managed Funds Association Submission to CFTC, Re: Industry Filings IF 13-004, 13-005, and 13-007, November 21, 2013, https://comments.cftc.gov/PublicComments/ViewComment.aspx?id=59381.

[261] CME Group Volume and OI by Product, January 2, 2014, filename: daily_volume_20140102.xlsx, ftp://ftp.cmegroup.com/daily_volume/, where T1U is the 2 year deliverable MAC swap, F1U is the 5 year deliverable MAC swap, N1U is the 10 year deliverable, and B1U is the 30 year deliverable. MAC Swap Future A CME Deliverable Swap Future, CME Group, 2015, p. 8, https://www.cmegroup.com/trading/interest-rates/files/mac-overview.pdf.

[262] Exhibit 5904, [redacted].

270. In support of his view that IRS products were traded infrequently, Professor Johannes cites a trueEX Presentation of October 21, 2013, which notes that it "doesn't make sense to MAT every IRS combination."[263] Yet Professor Johannes' report neglected to mention that the same trueEX presentation includes the results of an October 2013 survey of over 30 IRS firms, both buyside and market makers, which showed that over 50% of those surveyed indicated they would want MAC tenors (1, 2, 3, 5, 7, 10, 15, 20, 30) to be MAT. Another 20% of those surveyed would want "[a]ll whole year tenors 1-40 years" to be MAT, while between five and ten percent wanted "every custom start date and end date from 1-40 years" to be MAT.[264]

271. I earlier cited [redacted] As early as April 2009, from the "Big Bang" in the index CDS market,[265] market participants had already become familiar with the fungibility benefits of standardized coupon rates and fixed quarter-end maturity dates. In the but-for world, MAC swaps would have quickly been an obvious complement to benchmark IRS for creating liquid AA2A trade of IRS.

E. In the but-for world, some dealers would be early-mover AA2A supporters

272. In previous sub-sections, I explained why AA2A trade for many IRS products was feasible before 2013. In this sub-section, I explain how, in order to protect their individual economic interests, dealers would have accelerated this transition in the but-for world. Both dealer economic incentives and record evidence supports that, absent the alleged conspiracy among dealers to block AA2A trade, at least some dealers would have sought competitive advantage by being early market movers. Dealers would have supported an agency model for providing access for their customers to AA2A platforms because this approach would have mitigated disintermediation of the dealers. Acting on the basis of their individual incentives, dealers would have supported and facilitated

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[263] Johannes Rep. ¶24.

[264] [redacted] p. 8.

[265] Nicholas Vause, "The 'Big Bang' in the CDS Market," *BIS Quarterly Review*, December 13, 2010, https://www.bis.org/publ/qtrpdf/r_qt1012z.htm.

platform operators with steps that would have accelerated their launching of AA2A trade, including obtaining licenses as DCMs by 2012 or earlier.

273. For second-tier dealers, there were even greater economic incentives to move early by giving their customers access to AA2A trade. Second-tier dealers had low shares of IRS intermediation in the D2C RFQ, and thus less to lose through disintermediation of these legacy D2C RFQ franchises, and more scope for gaining market share from other dealers, albeit in lower-markup form of intermediation, AA2A trade. [redacted][266]

274. I was not surprised to see substantial record evidence of this economic incentive among second-tier dealers. Among this abundant record evidence are the following examples.

275. In his deposition for this matter, [redacted][267]

276. In his deposition, [redacted][268]

277. [redacted][269]

278. [redacted]

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[266] [redacted] Dep. Tr. at 95:17-24.

[267] [redacted] Dep. Tr. 46:6-9.

[268] [redacted] Dep. Tr. 136:2-22; *see also* Exhibit 2805, [redacted]

[269] [redacted], p. 11. [redacted] at Slide 32. [redacted]

[redacted][270]

279. [redacted][271]

280. [redacted]

[redacted][272]

281. [redacted]

[redacted][273]

282. [redacted]

[redacted]

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270 [redacted] at '014.

271 [redacted] at p. 5.

272 [redacted] p. 14. Emphasis in original.

273 [redacted] p. 37.

[redacted][274]

283. [redacted][275]

284. In a competitive market, the same individual-dealer early-mover incentives would encourage dealers move into new FCM clearing roles on exchanges. Even larger dealers saw that exchange trading would disrupt their legacy D2C RFQ businesses. For example, in addition to evidence cited in my opening report, [redacted][276]

285. As early movers, dealers would have offered "agency" execution to their customers. Dealers offer agency execution, also called "sponsored access," by giving buyside firms access to SEF platforms, including typically one or more CLOBs (including D2D CLOBs). Here, the dealer acts as an intermediary. [redacted][277] An agency model maintains the sales

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274 [redacted], at pp. 58-59.

275 Exhibit 6715, [redacted].

276 [redacted], at p. 7; *see also* [redacted], at p. 2 [redacted]

277 [redacted], at '398 [redacted]

relationship between dealer and client, mitigating the disintermediation of a dealer's OTC execution role.

286. Buyside firms benefit from an agency model because it obviates the need for the buyside entity to directly "onboard" to the platform themselves.[278] [redacted][279]

287. The record also indicates that buyside entities expressed interest in agency services for IRS SEF platforms to the dealers in this case.[280]

288. [redacted][281] An internal

[redacted]

[278] Exhibit 640, [redacted], at p. 29 [redacted] *see also* Exhibit 5508, [redacted] Neal Decl. ¶¶8-9, 12 (discussing the ability for a participant to access Javelin's CLOB without establishing its own connection, through an agency mechanism); Hirani Decl. ¶29; Martin Decl. ¶¶26-27.

[279] [redacted] Dep. Tr. 289:6-17.

[280] *See, e.g.*, [redacted] Dep. Tr. 79:9-80:5 [redacted] Dep. Tr. 299:5-299:23 [redacted]

[281] [redacted], at '074-'075. [redacted] *see also* [redacted], at '432 [redacted]

[redacted][282]

289. The first-mover incentives of dealers are magnified by the agency model. A dealer that allows other dealers to develop their agency services first would risk not being ready when the market moved towards a liquid CLOB, and thus lose customer market share to competitor dealers.

290. Given these structural economic incentives, I was not surprised to see abundant record evidence indicating that many of the dealers recognized the importance of acting as an early mover using the agency approach. [redacted][283]

291. [redacted][284]

292. [redacted][285]

293. [redacted]

[redacted]

282 [redacted]

283 [redacted] Dep. Tr. 266:10-15.

284 [redacted] Dep. Tr. 84:20-24; *see also* [redacted] Dep. Tr. 85:5-22.

285 [redacted], at p. 9.

[redacted][286]

294. Dealers did not merely hypothesize the advantage of providing agency services. [redacted][287] [redacted][288]

F. Platforms could offer AA2A trade, even in the actual world, by 2013

295. As I explain in my opening report, all of the ingredients necessary for AA2A IRS trade existed prior to 2013. The Defendants' experts have responded, in part, by arguing that Javelin, Tera, and trueEX were not operationally ready until a later point in time. However, I have seen abundant record evidence, including deposition testimony elicited after the filing of my first report, strongly suggesting that multiple trading platforms were capable of supporting AA2A IRS trade by 2013. Absent dealer resistance to providing liquidity and clearing services and to onboarding their buyside clients to use these platforms, there would have been active all-to-all anonymous trade on at least a subset of

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[286] Exhibit 3105, [redacted], at '864.

[287] [redacted] Dep. Tr. 341:9-11 ("[W]e offered agency execution on trueEX and we cleared trades for clients in that manner."); [redacted] Dep. Tr. 228:24-230:12 [redacted] Exhibit 6326, [redacted], at '825 [redacted] Dep. Tr. 77:11-77:20 [redacted]

[288] Exhibit 5184, [redacted] Exhibit 1812, [redacted], at p. 2 [redacted] Exhibit 1328, [redacted], at '687-688 [redacted]

these platforms well before 2013. As I explain, moreover, once significant AA2A trade existed on any of these platforms, a large-scale migration of trade onto those platforms and additional platforms would be expected.

296. In his deposition, Professor Johannes admitted that he was not asked to opine "one way or the other on why Javelin and Tera failed" and that, despite stating in his report that they suffered from "a lack of widespread interest," he "[did not] offer a specific opinion" on why the platforms failed.[289]

297. Dr. Culp and Professor Johannes argue that the IRS market was not ready for a transition to anonymous all-to-all trade before CFTC-mandated SEF trade began in early 2014. Dr. Culp and Professor Johannes base these arguments on what happened in the actual world. Their reports do not appear to consider record evidence supporting the conclusion that multiple platforms, including Javelin, trueEX, and legacy IDB platforms such as ICAP and Trad-X, had the technological capacity years prior to that date for AA2A trade, and that multiple platforms had completed the required licensing and business planning to launch AA2A trade before that date. Their opinions also ignore the fact that the buyside was engaged in the central clearing of IRS trades long before the CFTC mandate.[290]

298. Professor Johannes also rejects the assessment by Plaintiffs' expert Professor Mark Grinblatt that the but-for impact of anonymous all-to-all trading on bid-ask spreads would have occurred by January 1, 2013. He argues that Professor Grinblatt's finding is "inconsistent with the state of the industry at the time."[291] Professor Johannes ignores, however, the impact of the alleged dealer boycott on the readiness of all-to-all platforms. Professor Johannes instead uses the platforms' *actual* earliest trading dates as though those actual-world dates reflect but-for readiness.[292]

299. Dr. Culp and Professor Johannes further opine that any anonymous all-to-all trading would have been delayed until the MAT requirement date of February 15, 2014, even in a world with no dealer resistance to anonymous all-to-all trade.[293] As I explained in my original report, the marketplace was ready for active AA2A trade before 2010 at the latest,[294] before even the Dodd Frank Act. Absent the alleged conspiracy, at least some dealers acting in their own competitive interests had strong economic incentives to support early electronic trade-platform entrants with the provision of liquidity.

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[289] Johannes Dep. Tr. 86:19-87:12.

[290] CFTC's Clearing Requirement Determination Under Section 2(h) of the CEA, 77 FR 74284 at 74322-23 (Dec. 13, 2012).

[291] Johannes Rep. ¶222.

[292] Johannes Rep. ¶¶222-223.

[293] Johannes Rep. ¶224; Culp Rep. ¶¶371-405.

[294] Duffie Rep. ¶¶78-90.

300. The Defendants' experts also erroneously presume that the paucity of anonymous all-to-all trading prior to SEF registration and MAT trading dates somehow demonstrates that anonymous all-to-all platforms could not be ready prior to those dates, absent the alleged conspiracy. This is circular reasoning. SEF registration and MAT trading dates reflect the regulator's timeline for the *mandated* availability of anonymous all-to-all IRS trading. The evidence indicates that defendant dealers resisted onboarding to these platforms.[295] Dealers also resisted the provision of liquidity before those deadlines. After the mandatory dates, the Defendant dealers had no choice but to provide at least minimal cooperation.

301. The Plaintiffs allege that the Defendant dealers blocked active all-to-all trade. It is not logical to cite the absence of active all-to-all trade by a certain date to support an assertion that, in the absence of the alleged dealer blocking actions, all-to-all trade was infeasible by that date. Moreover, launching platform trade requires dealers to onboard, test, provide liquidity, and sign up as FCMs to clear trades.[296] In the but-for world, given the technical platform capabilities that I identify in my opening report and here, platforms facing no resistance from dealers would undoubtedly have been able to move much more smoothly and rapidly through these early stages of development, and would have obtained enabling support from dealers, who would have sought to gain a competitive edge in the provision of liquidity on these platforms.

1. Javelin

302. With liquidity support from dealers, the record strongly suggests that Javelin could have had active anonymous all-to-all trade before January of 2013.

303. While Javelin obtained its SEF certification on September 19, 2013, the record evidence that I have seen indicates that, in a but-for world in which dealers had responded supportively to Javelin's early trade activity, the platform would have been ready for AA2A trade before that time, and could have obtained a DCM license to launch its CLOB before obtaining the SEF license.

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[295] Duffie Rep. ¶¶154-158; [redacted] Steele Dep. Tr. (Javelin, Managing Director of Business Development), pp. 40-43, 188, 208; Sullivan Dep. Tr. (Javelin, Chief Executive Officer), pp. 288-289; Iqbal Dep. Tr. (Javelin, Chief Information Officer), pp. 159-160; Sheehan Dep. Tr. (trueEX, Director of Clearing and Client Relations), pp. 118, 221-222; Neal Dep. Tr. (Javelin, Managing Director, Operations and Chief Operating Officer), pp. 136, 313; Hirani Dep. Tr. (trueEX, CEO), pp. 573, 576, 636; Feda Dep. Tr. (trueEX, Director of Sales and Marketing), pp. 170-172, 286.

[296] Commodity Futures Trading Commission, Form SEF, Swap Execution Facility Application or Amendment to Application for Registration, Exhibit T and Core Principle 14. 78 FR 33476, 33598, 33602.

304. My understanding is that Javelin's "first fully cleared, anonymous trade" occurred in 2010, although this first trade was not conducted in an electronic order book.[297] By November 2010, Javelin's CLOB had established a live messaging connection with the clearinghouse operated by CME, enabling the real-time transmission of information about IRS trades executed on the CLOB to be cleared by the CME.[298]

305. Javelin conducted further testing in 2011 of 21 IRS trades, showing the platform's "capability to trade interest rate swaps," though not yet "live in production."[299] Dow Jones Newswire reported that Javelin "saw $4.1 billion of interest-rate swaps processed in record time," with an average ticket of $195 million, all cleared by CME.[300] The counterparties were ING and Citadel.[301] By January 2012, I understand that Javelin had already cleared $4.1 billion in swaps trades with CME, "90% of which cleared in under 2

[297] JAV_01544328, at p. 2; Iqbal Decl. ¶7(a). [redacted] *see also* [redacted]

[298] Iqbal Decl. ¶7(b).

[299] Iqbal Decl. ¶7(c); Iqbal Dep. Tr. 42:13:43-12 (Mutasar Iqbal, Javelin's former Chief Information Officer, testified the transaction was a "pilot trade," carried out "sometime towards the end of 2011": "Q. It was roughly three years from the time you joined until the platform started trading interest rate swaps. Is that consistent with your recollection? A. I think not entirely, right. When you say it started trading interest rate swaps, do you mean live in production or do you mean the capability to trade interest rate swaps? From a technical perspective, that has to be -- clarity needs to be provided. Q. Unless I say otherwise, I'm talking about customers of Javelin actually trading and entering into transactions for interest rate swaps on Javelin platform that are executed and then cleared. A. Okay. Q. Does that make sense? A. Yes, it does. Well, I think we did our first pilot trade a long time before that. Q. When was that? A. I think it was -- I can give you a time frame. Sometime towards the end of 2011.").

[300] JAV_01536585, at '586 (Dow Jones reported that, "[t]he trades came in an array of maturities, including $747 million of two-year swaps, a $1 billion of three year swaps, $985 million of five-year swaps, a $1 billion of seven-year swaps and a total notional $377 million 10-year swaps … Dealer banks and investment firms who participated did so anonymously for the most part." Iqbal testified the "pilot trade" was cleared by CME. Iqbal Dep. Tr. 44:17-24 (Iqbal testified that he did not know who the FCMs for the parties were. He was specifically asked if Bank of America was the FCM for Citadel, and he testified that did not know.). Javelin materials, used in a presentation to Citadel in April of 2012, stated that Javelin had executed $4.1 billion in IRS, comprised of 21 trades. JAV_01544328 at p. 2 (Company Background page "Who We Are" section includes: "Market First. Executed $4.1 Billion IRS Trades Real Time at CME (21 trades, Avg Time 1.92 Secs, Avg Ticket $195MM); Iqbal Dep. Tr. 79:8-22 (asked about this language, Iqbal could not recall the number of trades in the "pilot trade," but did not dispute the premise that this bullet referenced the 2011 "pilot trade").

[301] Iqbal Dep. Tr. 44:2-7.

seconds."[302] Javelin also conducted additional tests of its platform that confirmed its AA2A capabilities prior to 2013.[303]

306. The record also indicates that Javelin's original plan was to begin full-scale trading by the end of 2011.[304] Javelin postponed full-scale trading to 2012 because of a lack of meaningful liquidity provision and FCM support from the dealers.[305]

307. Even in the actual world of alleged blocking by dealers, Javelin's CLOB was ready for "mock trades" in August of 2013. While the Defendants rely on an email by Mutasar Iqbal, Javelin's former Chief Information Officer (CIO), suggesting that the platform had not been sufficiently tested to go live in September 2013, Mr. Iqbal actually testified that the code was "stable" and the business simply wanted some "cosmetic changes" on the front end that needed more testing.[306]

308. In August of 2013, Javelin even planned a schedule of mock trading "to prime the clients of Javelin SEF to use the application and the platform, or to use that platform as if it was during live trading hours."[307] Participants included RBS, INC, and Scotia Bank.[308] Javelin's CIO, Mr. Iqbal, testified that "the SEF was live prior to [the mock trading],"

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[302] JAV_00007670, at '670 (Jan. 9, 2012 email from James Cawley (Javelin, CEO) to Matthew Hatton-Poole (DE Shaw), in which Mr. Cawley writes, "Javelin & CME executed $4.1 Billion in swaps trades – 90% of which cleared in under 2 seconds. Avg. trade size $195MM with trades executed across the 2yr, 3yr, 5yr, 7yr and 10yr curve points."); *see also* Iqbal Decl. ¶7(c).

[303] Iqbal Decl. ¶7(d); JAV_01239577, (Nov. 9, 2011email from Suellen Galish (Javelin, General Counsel) to Thomas Shashaty (Alliant, Account Executive), in which Ms. Galish writes "The trade that occurred last summer was a test trade and the revenue generated was $2,500."); JAV_00006796 (Dec. 7, 2011 email between Chris Koppenheffer (Javelin, Senior Managing Director) and Jeffrey Gore (Wells Fargo, Managing Director) discussing test trade and limitations thereon based on CME constraints.); JAV_01662869, at '869 (Aug. 16, 2012 email from Santosh Verma (RBS, Senior Developer, Markets and International Banking) to Vincent Tomasi (RBS) confirming that "the link Javelin -> CME -> STyLE is correctly set up now" and that accepted messages for test trades "were processed correctly and are ready to undergo matching"); JAV_00940612, at '612 (Nov. 26, 2012 email from Kevin Slader (SGCIB, former Programmer Analyst, current Senior Data Scientist) to Mutasar Iqbal (Javelin) stating "My goal is to execute a trade for more than 2 mil on SOCGENTRADER1 today to go over the limit and confirm the behavior.").

[304] JAV 00250591.

[305] JAV_00275472; JAV_00039952, at '956.

[306] Iqbal Dep. Tr. 183:12-24. He was also concerned that the dealers had not signed up and there was no liquidity. Iqbal Dep. Tr. 188:22-192:4. *See also* JAV_00890172 ("I am not sure liquidity is ready."). Mr. Iqbal agreed that none of these issues affected Javelin's ability to provide the technical work with the dealers that he was working on. Iqbal Dep. Tr. at 399:5-11 ("The technical work carried on regardless of those issues, so there was no impact.").

[307] Iqbal Dep. Tr. 149:2-5; *see also* JAV_00010216 (listing goals to include "Test connectivity into Production").

[308] JAV_00010216.

and the "limit order book was available."[309] Already at this time, thus, Javelin offered CLOB trading of swap spreads even in the actual world.[310]

2. Tera

309. My understanding of the record is that Tera was already actively testing its platform in 2012 and could have moved towards launching anonymous all-to-all trade sooner, absent dealer blocking efforts.

310. Tera's CEO testified that there is no reason why Tera could not have been up and running before 2013.[311] Tera registered as an Exempt Board of Trade in June 2011.[312] The platform's documents show that it believed the first trades would begin in 2012.[313] Tera was testing its clearing capabilities with CME by April 2012.[314] [redacted][315] [redacted][316]

[309] Iqbal Dep. Tr. 150:5-24; *see also* Iqbal Dep. Tr. 150:5-153:25 ("Q. And from your perspective, was a mock trading exercise a necessary step in the process to launch the SEF? A. So the SEF was live prior to that, right, the -- the SEF was live prior to that. The limit order book was available. This was just to further establish how things would operationally look when you have multiple participants on the platform at the same time as opposed to piecemeal involvement of participants…. [I]t was available. It was built. It was ready to go; hence, the mock trading schedule… Q. You see under "Dates" this mock trading schedule shows that as of August 7th, there was going to be two phases for the mock trading? Do you see that? A. Yes. Q. And the dates for the first phase were August 20, 2013 to August 24, 2013. Do you see that? A. Yes. Q. Did the mock trading actually happen then, do you recall? A. It should have. I don't recall if it did, but it must have happened then, yes. There should have been a follow-up e-mail to this if it did happen. Q. Is it consistent with your recollection that there was a mock trading session in August of 2013? A. Around that time frame, yes… Q. And the dealer list under "Dealers Confirmed" says "RBS, ING and Scotia." Do you see that? A. Yes.").

[310] Iqbal Decl. ¶18.

[311] Martin Dep. Tr. 37:6-39:20 (Tera had the ability to do IRS trades "[a]lmost from day one under the way the business was done up until 2013."); Martin Decl. ¶¶6, 13-17.

[312] TERA_00920288; TERA_00920278.

[313] TERA_00107435, at '441.

[314] TERA_00369751 (Apr. 20, 2012 email meeting appointment confirming testing between Tera and CME).

[315] [redacted]

[316] [redacted], at '806 [redacted]

311. [redacted][317] In November 2012, Tera undertook additional testing and expected to be "executing cleared transactions in the next few weeks."[318] Tera continued successful testing with clients through December 2012.[319] Tera was "operationally ready" for OTC trades in January 2013,[320] but faced resistance from dealers to providing liquidity.[321]

3. trueEX

312. In the actual world, trueEX acquired a DCM license in September 2012, permitting the launch of its CLOB before January of 2013. In the but-for world, the platform could have gained sufficient liquidity and dealer support to sustain active anonymous all-to-all trade before January of 2013.

313. To my knowledge, trueEX was the first DCM permitted to list for trading IRS under Dodd Frank.[322] On September 28, 2012, the CFTC approved trueEX as a DCM, providing the necessary licensing for its launch of CLOB trade, even before trueEX's SEF certification.[323] CEO Sunil Hirani testified that the platform was prepared to launch "shortly thereafter." Indeed, Mr. Hirani has stated that the platform was "operationally ready to execute and trade IRS as of September 2012 at the latest."[324] In order to obtain its DCM license, trueEX was required to demonstrate the operational readiness of its CLOB to CFTC staff.[325]

314. DCM status enabled trueEX "to offer market participants a Dodd-Frank compliant platform where the rules are already finalized and approved by the CFTC" by the end of

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[317] [redacted]

[318] TERA_00107245, at '245 (Nov. 16, 2012 email between Thomas Taylor (Tera) and Frederic Dassori (CS) confirming sending test trades into test account on behalf of CS and the CME and that Tera "will be executing cleared transactions in the next few weeks").

[319] TERA_00853022, at '022 (Dec. 3, 2012 email between Michael Dennis (Newedge) and Phillip Boeding (GS Energy Partners) stating that a test trade between Tera and GS Energy had been facilitated).

[320] TERA_00107415.

[321] TERA_00094034.

[322] Release No. 6371-12, CFTC Designates trueEX LLC as a Contract Market (Sept. 28, 2012), https://www.cftc.gov/PressRoom/PressReleases/pr6371-12 ("trueEX... initially [] intends to list for trading interest rate swap contracts. It will be the first designated contract market to do so as permitted under the Dodd-Frank Act."); *see also* [redacted], at '731 [redacted]

[323] TRUEEX-IRS-4548115; Hirani Decl. ¶14.

[324] Hirani Dep. Tr. 139:9-11; Hirani Decl. ¶¶10-21.

[325] Hirani Decl. ¶¶14-17.

2012.[326] The purpose of the DCM was to "[c]reate a regulated entity pre Dodd-Frank that allows a path to onboard today."[327] [redacted][328]

315. [redacted][329]

316. Based on record evidence, it also appears that trueEX began efforts to recruit dealers to provide liquidity as early as 2011.[330] By April 2012, trueEX had entered into agreements with CME and LCH to allow central clearing.[331] By October of 2012, trueEX had the functionality to receive a daily "push" of credit limits for buyside clients to trade on trueEX by FCMs.[332]

317. The record also appears to establish that trueEX had a functional AA2A platform by the end of 2012. If dealers had acted on the first-mover incentives that I detailed above to

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[326] TRUEEX-IRS-5037656 (Nov. 8, 2012 email from Lauren McFall (trueEX, Director of Sales) to Scott Patterson (Wall Street Journal) stating that with the DCM legal structure trueEX is poised and ready to offer market participants a Dodd Frank compliant platform); Hirani Decl. ¶12.

[327] TRUEEX-IRS-5163412.

[328] [redacted] at '224 [redacted] *see also* Dep. Tr. 144:6-13 [redacted]

[329] [redacted] at p. 36.

[330] Hirani Dep. Tr. 76:3-5; 87:4-15.

[331] Hirani Decl. ¶18.

[332] Hirani Decl. ¶19.

support trueEX, Tera or Javelin, and had they provided meaningful quote liquidity to these platforms, it seems highly plausible that at least one of these platforms would have triggered a major migration to AA2A trade.

318. In their testimony, trueEX witnesses indicate that, in the but-for world, the platform's resources would have been even more aggressively focused on building and launching the CLOB technology, allowing for an earlier timeline focused on the capacity for anonymous all-to-all trade. Kumar Doraiswami, Chief Business Development officer at trueEX, testified that they "always talked about all the three functionalities as available on the platform" and "continue[d] to engage with clients and incent them to trade on the CLOB and RFQ for more new risk trades over time."[333] Director of Sales and Marketing (Americas) for trueEX, Matthew Hoddy Mahon, testified that, "When I got to trueEX we were focusing on the CLOB" and that "CLOB was the initial."[334] Mahon testified that "PTC [post-trade compression] was nice to have" but they "like[d] CLOB because we would like to have tighter prices."[335] Mahon testified that dealers' actions shaped trueEX's strategic efforts, and that if the market was not ready for CLOB trading it was because "the top seven banks weren't [ready]."[336]

319. Even in the actual world, trueEX continued to develop its platform functionality. In particular, I understand that trueEX rolled out functionality for post-trade allocation to multiple accounts, for terminations, and for swaption trading. In trueEX's June 2016 Board slide deck, its "Business Expansion Roadmap" slide lists post-trade allocations[337] as occurring in 2014, terminations in 2015, standard RFQ and custom RFQ in the first half of 2016, and swaptions and spread trading, to be available in the second half of 2016.[338] In a but-for world in which trueEX had been supported by dealer liquidity, I believe that trueEX would have brought these additional functions online much sooner.

4. Bloomberg

320. [redacted]

[333] Doraiswami Dep. Tr. 57:15-20, 59:10-14.

[334] Mahon Dep. Tr. 121:3-11.

[335] Mahon Dep. Tr. 120:4-10.

[336] Mahon Dep. Tr. 125:9-126:12 ("Q. One of the reasons that trueEX was focusing on the PTC was because it felt that the market was not ready for CLOB trading; is that right? A. Yeah, you could say that it was not ready, but who controls the market? Seven banks. So that could go on for decades… I think the markets were ready. I think the top seven banks weren't.").

[337] Christina Landry, trueEX's Head of Product, testified that trueEX never developed pre-trade allocation for RFQ or CLOB. Landry Dep. Tr. 172:19-173:18.

[338] TRUEEX-IRS-5100518, at p. 13.

321. [redacted][339][redacted][340][redacted][341][redacted][342]

322. [redacted][343][redacted][344]

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339 [redacted], at '345; "Bloomberg Launches Trading Platform for Derivatives Compliance," Bloomberg Press Release, September 22, 2011, https://www.bloomberg.com/company/announcements/bloomberg-launches-trading-platform-for-derivatives-compliance-2/. ("Bloomberg FIT has launched the first comingled trading platform for OTC swap trading, ALLQ Derivatives, which allows buyside investors to review indicative prices and execute directly with dealers on the Bloomberg Professional Service. The Platform will be adapted upon finalization of the SEF rules by regulators."); *see also* [redacted] Dep. Tr. 54:19-55:7 [redacted] Dep. Tr. 43:9-44:19

340 [redacted] Dep. Tr. 50:20-51:9 [redacted] *see also* Dep. Tr. at 80:25-81:10

341 [redacted] Dep. Tr. 88:23-89:18; *see also* [redacted] Dep. Tr. 45:22-46:4 [redacted] Dep. Tr. 46:11-14, 47:7-11

342 [redacted] Dep. Tr. 228:25-229:9 [redacted] Dep. Tr. 80:16-20

343 [redacted] Dep. Tr. 48:21-49:2; *see also* [redacted] Dep. Tr. 79:19-21

344 [redacted] Dep. Tr. 79:23-80:7

323. The record suggests that [redacted][345][redacted][346]

324. [redacted][347][redacted]

5. ICAP

325. The record also indicates that [redacted][348][redacted]

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[345] [redacted] Dep. Tr. 189:5-15 183:14-17 [redacted]

[346] [redacted] Dep. Tr. 199:11-16 [redacted] Dep. Tr. 69:8-13 [redacted] Dep. Tr. 135:25-136:14 [redacted] Dep. Tr. 75:24-76:7 [redacted]

[347] Nuara Dep. Tr. 232:7-23 ("[Bloomberg was] on every desk of every major bank and many buy-side participants, so they charge a flat fee for their platform... didn't have a charge to trade... their platform... was hideously anachronistic... Most participants didn't want to trade on it, but it was just there, so they did." ; Colucci Dep. Tr. 323:12-17 ("We were a young company so we needed to create some degree of revenue beyond $10." TERA_00508603 (Aug. 14, 2013 email in which Thomas Taylor (Tera) stated, "Bloomberg has a natural advantage in their installed customer base, but no one trusts them…"). [redacted] Dep. Tr. 52:24-25.

[348] [redacted] Dep. Tr. 19:24-20:21 [redacted]

326. [redacted][350][redacted][351]

327. [redacted][352] As I detailed in my opinion report, AA2A trade of IRS was clearly not in the collective interests of dealers. The fraction of trade that they would intermediate, and the profit margins on each trade, would both be significantly reduced. [redacted]

6. Trad-X

328. [redacted]

329. [redacted][353]

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[349] [redacted] Dep. Tr. 21:6-21:17 [redacted]

[350] [redacted] Dep. Tr. 26:2-26:14, 38:19-40:12. [redacted] Dep. Tr. 29:8-30:11.

[351] [redacted] Dep. Tr. 42:14-42:23.

[352] [redacted] Dep. Tr. 122:23-124:24; *see also* [redacted] Dep. Tr. 137:2-138:6 [redacted] Dep. Tr. 165:8-11 [redacted]

[353] [redacted] Dep. Tr. 45:11-14 [redacted]

[redacted][354][redacted][355]

330. [redacted][356][redacted][357][redacted]

[redacted] Dep. Tr. 48:16-17 [redacted] *see also* [redacted] Dep. Tr. 50:12-23 [redacted]

354 [redacted] Dep. Tr. 175:21-25.

355 [redacted] Dep. Tr. 77:8-22 [redacted] *see also* CS-IRSLit-00253410; [redacted] Dep. Tr. 180:14-16 [redacted]

356 [redacted] Dep. Tr. 48:20-23; *see also* [redacted] Dep. Tr. 50:12-23 [redacted] *see also* [redacted] Dep. Tr. 179:14-180:16 [redacted]

357 [redacted] Dep. Tr. 143:18-145:4 [redacted]

[358] The record further indicates that [359]

331. [360] [361] [362]

G. Allocation and average pricing did not impede AA2A trade

332. Professor Johannes argues that lack of fungibility of IRS would prevent migration to AA2A trade.[363] Professor Johannes also suggests that many asset managers avoid trading IRS on anonymous all-to-all platforms because they cannot allocate IRS trades executed on a CLOB across multiple accounts at a single average price.[364] This issue can be overcome directly with MAC swaps, because MAC swaps of a given IMM date have the

[358] Dep. Tr. 216:20-25; *see also* Dep. Tr. 212:13-24

[359] , at '324 *see also* Dep. Tr. 42:23-43:9; Dep. Tr. 57:5-25

[360] Dep. Tr. 87:6-15

[361] , at '616-'617 *see also* Dep. Tr. 125:20-128:10

[362] Dep. Tr. 128:11-25.

[363] Johannes Rep. ¶68.

[364] Johannes Rep. ¶14.

quarterly IMM coupon dates and the same fixed-side coupon rate on successive trades. As I have explained, MAC swaps were designed for fungibility.[365]

333. I have also seen record evidence suggesting that the "allocation" and "average pricing" issues identified by Professor Johannes were not an impediment to AA2A trade. [redacted][366]

334. [redacted][367]

335. Christina Landry, former head of product and trueEX employee from 2011-2018, testified in detail about trueEX's platform functionality. She testified that average pricing is not synonymous with pre-trade allocation. Ms. Landry's testimony breaks down the functionality into: averaging, pre-trade allocation, and post-trade allocation.[368]

336. Ms. Landry testified that post-trade allocations were available first, and soon after trueEX's initial launch in 2013.[369] She testified that pre-trade allocation was available via trueEX's Portfolio Terminations and Compactions (PTC) functionality soon after trueEX's PTC function was launched. Based on Ms. Landry's testimony, average pricing functionality was likely available in 2016. In general, she testified that trueEX had post-

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[365] SIFMA Asset Management Group, Market Agreed Coupon Contract for Interest Rate Swaps, April 23, 2013; SIFMA Asset Management Group, Rationale for Market Agreed Coupon Contract for Interest Rate Swaps, April 23, 2013.

[366] [redacted]

[367] [redacted], at '645.

[368] Landry Dep. Tr. 184:6-14 (testifying that averaging is not synonymous with pretrade allocation).

[369] Landry Dep. Tr. 222:23-223:25 ("Do you recall when trueEX first offered the ability to allocate trades across multiple accounts with multiple FCMs? A. Multiple – again, I don't remember exact dates. From what I believe happened, we rolled out post trade allocations in general, support for that soon after we launched as a platform itself. So around – what is it, 2013. So soon after our launch in 2013, we supported our trade allocations workflow. And I believe either upfront, it supported multiple clearing firms or we followed up with that pretty soon after. So I think that work flow, that was already there… It was an extra level of complexity in that workflow because we require credit checks as a part of one transaction from multiple counter parties and not just one counter party, but that was logic that we built in… definitely before 2017."); *see also* Hirani Decl. ¶¶54-58.

trade allocation via RFQ shortly after the platform launched in 2013.[370] She also testified that trueEX's CLOB had post-trade allocation.[371] Ms. Landry testified that trueEX explored pre-trade allocation but first needed liquidity on the CLOB.[372] She testified that clients could use the PTC tool to do "new-risk" pre-trade allocations.[373] TrueEX had an average-pricing solution for CLOB trades through its application program interface (API).[374] This functionality was, as I understand it, likely available in spring 2016.[375] Further, it appears that in 2015 trueEX discussed average pricing internally and with CME. trueEX personnel believed that the most logical place to house average-pricing functionality was with clearinghouses. They discussed this issue specifically with CME.[376]

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[370] Landry Dep. Tr. 185:7-21 (Q. "Okay. During your time at trueEX, did trueEX ever develop a solution for – that would allow clients to allocate trades executed by RFQ? A. Allocate trades executed through RFQ? Q. Yes. A. Yes. Q. Okay. Was that a pretrade allocation solution or a post trade allocation solution? A. Definitely post trade. We – I don't believe we ever developed pretrade allocations for RFQ before I left. Q. When did you develop post trade allocation for RFQ, if you remember? A. I don't remember the exact date. It was soonish after initial launch.").

[371] Landry Dep. Tr. 185:25-186:6 ("Q. Did you ever develop technology to allow clients to allocate trades executed on a CLOB? A. Yes. Q. Was that pretrade allocation or post trade allocation? A. Post trade allocations.

[372] Landry Dep. Tr. 186:14-187:1.

[373] Landry Dep. Tr. 205:20-206:22 ("Q. Did you – did you eventually implement any pretrade allocation workflow before you left? A. Pretrade – PTC could be used as a pretrade allocation tool for an RFQ workflow. Q. Okay. A. So, yes. Q. Would that be for new risk trades? A. It could be for new risk trades, terminations or a combination of the two. Q. Did anyone ever use PTC platform in that fashion for pretrade allocated trades? A. Not that frequently. Q. Did it ever happen? A. I don't remember. I believe it did, but it was not – not as – not as frequently as terminations or compressions. Q. Did trueEX encourage buyside firms to use the PTC platform for new risk pretrade allocated trades? [repeats question] A. I believe we did to some extent, as a stepping stone, until we supported that through RFQ.").

[374] Landry Dep. Tr. 199:18-200:2 ("Did trueEX develop an average pricing workflow for the PTC offering? A. I don't think we did, that was ever available over the UI. Okay. Did – okay. Did trueEX ever offer an average pricing solution that was available for trades executed on the CLOB? A. I actually think we covered this earlier, and I think my answer might have been no. I don't remember that. Or I think that's what I said. Now that my memory—or now that I'm seeing this, I actually think we did roll it out to be available – to be triggered through an API or anyone with an API connectivity.").

[375] Landry Dep. Tr. 217:2-4 ("Q. So you think you implemented [average pricing] sometime, I guess, between March of 2016 and March of 2018? A. I think so."). Ms. Landry also testified that she believed trueEX had allocations available before truePTS. Landry Dep. Tr. 220:10-16. TruePTS made average pricing available in March 2016. "truePTS Advances Regulatory Reporting for Derivatives," March 16, 2016, https://www.trueex.com/media/70; *see also* [redacted]

[376] Landry Dep. Tr. 212:10-25 (testifying that trueEX discussed average pricing with the buyside and it was most logical for the clearing houses to prioritize and provide average pricing functionality).

337. Javelin also appears to have developed solutions to allocation and average pricing, although Javelin maintained that had its CLOB or any other CLOB developed adequate liquidity, clearinghouses would have resolved these issues.[377]

H. Block trades would have benefited in the but-for world.

338. In the next two sections, I respond to the Defendants' experts' arguments that block trades and package trades are unsuitable for AA2A trading.

339. Professor Johannes stated his view that block trades are unsuitable for trading on AA2A platforms because large anonymous trades would cause information to leak and spreads to widen.[378] In my opening report,[379] I give a detailed analysis of the reduced cost of block trades in the but-for world. The existence of active AA2A trade as an option would discipline dealer quotes, lowering the costs of trading the block, even for blocks executed via RFQ or voice. Likewise, equity block trades are often arranged in the "upstairs" OTC market, where the investor gets a better price from dealers because of exchange price discovery and the option to trade some of the block on the exchange order book, both of which discipline dealer quotes. Block trades can also be efficiently shredded, in whole or in part, into small trades for efficient execution on CLOBs, as I have explained in paragraphs 126 and 127, this is the norm for CLOB trade of on-the-run treasuries.

340. Even in the actual world, SEF platforms had the ability to execute large trades on their CLOB and RFQ platforms. There are indications in the record that buyside entities, even in the actual world, shifted some execution of block trading to SEF platforms.[380]

341. For example, in a 2019 letter to the CFTC on behalf of Freddie Mac, Wendell Chambliss (Freddie Mac, VP and Deputy GC) wrote: "Over the last two years, approximately 99% of the rate swaps executed by Freddie Mac that are subject to mandatory clearing have been executed at a size that qualifies as a block transaction. Even with the vast majority

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[377] Iqbal Decl. ¶¶26-35.

[378] Johannes Rep. ¶¶285–296, Ex. Q.

[379] Duffie Rep. ¶¶169-171.

[380] TRUEEX-IRS-4548110, at '112 (December 11, 2015 email from Tom Feda (trueEX, Director of Sales and Marketing) to Matt Rabuse (Bridgewater, Head of Business Development - Fixed Income Trading) describing the TrueEx SEF CLOB as an "all to all platform that provides clients with a venue to trade truly anonymously (curve trades, MAC and BLOCK)"); JAV_01912424, at '424 (November 3, 2015 internal Javelin email from Suellen Galish (Javelin, Senior Managing Director, GC, and Chief Compliance Officer) interpreting Rule 515(3): "Block trades are executed off of the SEF (and submitted to the SEF for clearing and swap data reporting) and are subject to 15 minute delay for publication of trade data. There is no prohibition against executing a block size trade on the CLOB, but it will not be treated as a block trade – the trade is executed on the SEF and there is no time delay for publication of trade data."); Hirani Decl. ¶41.

of trades being above block size, in 2018 Freddie Mac executed over 80% of its cleared swap trades on a SEF in competition between at least two dealers."[381]

342. To discuss potential costs of splitting large block trades into smaller trades for CLOB execution, Professor Johannes relies on deposition testimony from three witnesses. All of these witnesses testified that, above all features, the critical feature for selecting an execution platform or method is the availability of liquidity. This testimony and the experience at treasuries CLOB platforms are consistent with a but-for world in which some block trading would remain off-SEF, leaving however a significant amount of block-size trading interests executed on SEFs and CLOBs. Moreover, buyside firms executing block trades via D2C trades would have gotten better prices in the but-for world because of the price-disciplining effect of the existence of active AA2A trade.

343. Professor Johannes cites[382] [redacted] [383] [redacted] [384]

344. Similarly, Professor Johannes cites[385] the May 8, 2019 deposition of [redacted] [386] [redacted] [387]

345. Also cited by Professor Johannes was the deposition of [redacted] [388] [redacted]

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[381] Letter from Wendell Chambliss (Freddie Mac, VP and Deputy GC) to Christopher Kirkpatrick (CFTC, Secretary), re: Swap Execution Facilities and Trade Execution Requirement (RIN 3038-AE25), March 15, 2019.

[382] Johannes Rep. ¶292, fn. 431.

[383] [redacted] Dep. Tr. 59:6-60:13.

[384] [redacted] Dep. Tr. 146:2-6, 148:7.

[385] Johannes Rep. ¶292, fn. 431.

[386] [redacted] Dep. Tr. 105:17-24.

[387] [redacted] Dep. Tr. 107:7-15.

[388] Johannes Rep. ¶292, fn. 431.

[redacted][389]

346. As I have explained, algorithmic trading on CLOBs provides an opportunity for high-frequency trading, and thus an ability to cheaply "shred" block trades. For example, a recent CFTC study[390] of the treasuries market shows that "Average trade size, in risk terms, is much higher for cash securities than for futures contracts. This is most likely due to the higher prevalence of automated trading in futures markets, which, in turn, results in futures trades being broken down into smaller orders for execution." The authors of this study also remarked that "A likely explanation for the difference in trade sizes is the difference in the microstructure of the two markets. About 80% of the futures trades in the sample are algorithmic. While cash markets have become more electronic over time, the extent of algorithmic trading and execution is much less in cash than in futures markets.[footnote omitted] In other words, algorithmic trading, which tends to break overall trade demand into a sequence of many small orders, is much more prevalent in futures markets."

347. In Section IV.J, I further discuss the incentive at CLOB venues for entry by high-frequency trading firms and for the breaking up of block trade interests so as to get cheaper execution.

348. In any case, the availability of AA2A trade leaves buyside firms with the option to execute some or all of a block by D2C RFQ, as I explained in more detail in my opening report.

I. AA2A package trade was viable and would have benefited buyside firms

349. Professor Johannes argues that package trades are not suitable for anonymous all-to-all trade.[391] He suggests two sorts of concerns: thin trading and the absence of suitable technology that would be available in a timely manner.

350. When addressing the question of packages, I separate the class of standardized and most commonly traded types of packages such as curves and butterflies,[392] which were viable

[389] [redacted] Dep. Tr. 280:24-281:14. [redacted] (objections omitted)).

[390] Lee Baker, Lihong McPhail, and Bruce Tuckman, "The Liquidity Hierarchy in the U.S. Treasury Market: Summary Statistics from CBOT Futures and TRACE Bond Data," Office of the Chief Economist, Commodities Futures Trading Commission, December 3, 2018, pp. 1, 7.

[391] Johannes Rep. ¶¶248-284, Exs. N, O, P.

[392] According to Clarus, curves and butterflies account for over 30% of volume on Bloomberg's SEF, which is dominated by D2C trade. See Chris Barnes, "USD Spreadovers and SEF Market Share," Clarus Financial Technology, August 14, 2018.

for AA2A trade, from the class of packages that, due to customization or excessively thin trade, likely would have remained available for trade only by other protocols. The nature of this separation is the same as that for other classes of IRS products, such as fixed-for-floating interest rate swaps. Those package types not traded on AA2A platforms still benefit from the parallel existence of AA2A trade of related products, primarily through substitution and price disciplining. The existence of AA2A trade, in general, removes no buyside options to trade via D2C RFQ. One doesn't need to revisit this entire set of issues for the case of packages.

351. In fact, some commonly traded types of packages are traded on SEFs. Indeed, this was required by CFTC MAT rules in June 2014. We can, accordingly, set aside Professor Johannes' technological concerns over the suitability of standardized packages for AA2A trade, because there is no significant technological distinction in the treatment of packages between SEF trade by RFQ and SEF trade by AA2A. The technology issue therefore comes down to one of timing. In the but-for world, would the technology for SEF trade of packages been available by 2013? On this question, Professor Johannes examines only actual-world timing, and even in that respect he ignores significant record evidence that I will review in this section.

352. On the question of thin trading, Professor Johannes believes that "[i]t is implausible that there would be liquid AA2A CLOBs for most curve combinations, as well [as] numerous other packages" because "packages trade infrequently... and are often customized."[393] Again, Professor Johannes considers only the actual world, and not the impact of the but-for world on trading activity. In my opening report, I explain and give examples of how AA2A trade causes significant increases in trade activity, primarily through reduced trading costs, broader participation, and substitution from other product types, with positive feedback effects among all of these. All of this applies to packages.

353. I agree with Professor Johannes that package trading is common and cost effective.[394] The more common and cost effective, the greater are the incentives for platform operators and buyside firms to have packages trade on AA2A platforms. Platform operators therefore actually built the capability for package trading on their AA2A platforms. This is in line with the case evidence and with the incentives of platform operators and buyside firms. Professor Johannes does not explain why platform operators invested in this technology if it was not viable.

354. Professor Johannes states that Javelin, Tera, and trueEX were "not ready to accept orders for package trades" until "substantially later" than September 2013, when the platforms received SEF licenses, relying on a single document from Javelin's production to

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[393] Johannes Rep. ¶270.

[394] Professor Johannes cites Comment Letter 59409, submitted to the CFTC by Adam Cooper of Citadel (Nov 29, 2013), Former Chief Legal Officer for Citadel, *see* Johannes Rep. FN 400, in which Adam Cooper warned of potential costs were the market to be deprived of the ability to execute package transactions. This fear is irrelevant to the but-for world I describe, in which SEF platforms would not have been starved of the resources to develop the capacity for electronic package trading.

conclude that "Javelin was not ready to execute package trades until sometime after July 2014," and citing a single deposition of a former trueEX employee to claim that trueEX was "not capable of executing frequently traded swaps spread packages trades at least through February 2018."[395] However, Professor Johannes ignores the extensive case record, that I cite below, demonstrating the technological ability of two of these platforms, Javelin and trueEX, to execute electronic package trades, and also documenting their efforts to build additional technological capabilities once the platforms had attracted additional liquidity.[396]

355. Professor Johannes makes no attempt to consider whether platform capabilities for package trade and their development timelines would differ in the but-for world from the actual world. In the but-for world, without the alleged dealer actions that delayed the platforms' abilities to raise capital and obtain liquidity, AA2A platforms would have developed the ability to trade packages much earlier than actually occurred.

356. [redacted][397][redacted][398]

357. [redacted]

[395] Johannes Rep. ¶223, fn 347, fn 349.

[396] [redacted] Dep. Tr. [redacted] 167:11-168:7 [redacted]

[397] [redacted].

[398] [redacted].

[redacted][399]

358. In the actual world, IDB order books did in fact offer package trading, demonstrating that offering SEF execution of such trades was not limited by technological capacity. For example, [redacted][400] In 2010, ICAP's IDB swap platform i-Swap[401] offered trading in some packages.

359. AA2A platforms could have offered package trading more quickly than regulatory deadlines required.[402] Professor Johannes suggests that a delay in mandatory SEF execution for swap spread packages until June 2014 implies that package trades could not have become available on all-to-all venues earlier. This ignores the impact of the alleged conspiracy. Professor Johannes cites a November 2013 letter from Citadel to the CFTC regarding concerns about the capacity of SEFs to settle the treasury leg of a swap spread.[403] He does not, however, acknowledge evidence from the record that Javelin developed the capability for CLOB trade of packages, including the treasury legs, as early as May 2014, demonstrating the ability to settle the treasury leg with technical

[399] [redacted]

[400] [redacted] Dep. Tr. [redacted]

[401] "List Provides Access to ICAP's i-Swap," *DerivSource*, October 28, 2010, https://derivsource.com/2010/10/28/list-provides-access-to-icaps-i-swap/.

[402] Professor Johannes cites to Comment Letter 61423, from Citadel (Sept 29, 2017), *see* Johannes Rep. fn 402, in which Citadel advocated for CME to amend its rules to end an exemption of invoice spreads to from SEF execution requirements. This letter does not, as Professor Johannes appears to believe, demonstrate that invoice spreads *could not* be traded on-SEF. Instead, it demonstrates the ongoing demand for the uniform availability of such capacity.

[403] Johannes Rep. ¶269, fn 401 (Comment Letter 59401, Citadel (Nov. 29, 2013)).

solutions during the class period.[404] This feature could have been offered earlier, before required by regulation, if the alleged dealer resistance had not occurred.[405]

360. In fact, platforms were developing package-trade workflows. SEFs including Javelin and trueEX rolled out solutions for all-to-all trade of packages. Those execution options improved over the course of the class period, demonstrating that delays were not caused by technical problems.[406] By mid-2014, Javelin appeared to offer AA2A execution for multiple package transactions, including the most common package types. As discussed above, it is my understanding that Javelin worked to offer curves and butterflies on its CLOB by the fourth quarter of 2014.[407]

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[404] JAV_01680517 (In a May 29, 2014 email, William Heins (Javelin, Former Interest Rate Derivatives Broker) described SEF package execution choices, including "Swap vs Treasury, where "Javelin "stands in middle as Riskless Principal for settlement" of the Treasury leg); JAV_01219236, at '238 (Sept. 5, 2014 email from Javelin's Richard Colucci (Managing Director) listing Javelin's package offerings at that time; CLOB packages listed were: Spread to Treasury, Curve, and Butterfly).

[405] [redacted] Dep. Tr. [redacted] 157:25-158:10 [redacted]

[406] [redacted] Dep. Tr. [redacted]

[407] Iqbal Decl. ¶19; JAV_01216410 (June 10, 2014 email stating that swap spreads were live on the CLOB, and indicating the curves and butterflies implementation schedule for CLOB was to be in production on June 30); JAV_01612297, at p. 5 (presentation for CFTC visit to Javelin on September 22, 2014 describing "Future Product Offerings" as including "in production during fourth quarter 2014" CLOB trading for "Curve and Butterflies for standard maturities" and MAC swaps); JAV_01161163, at '163 (May 19, 2014 email from Charlie Steele, Managing Director of Business Development at Javelin, in which he wrote that "very few SEF's will have the capability to trade Forward or MAC Swaps in a Packaged Format" but "Javelin has the ability (via voice at present and electronically by the end of June)" and that the platform would "begin to trade Curves and Butterflies in an All-to-All Central Limit Order Book by the end of May"); JAV_00005372, at 10 ("Javelin's future product development road map includes packaged transactions (Curves and Butterflies)."); *see also* JAV_00397309, at '311 (Ron Neal, Managing Director, Operations and Chief Operating Officer, of Javelin wrote on April 16, 2013 that "Javelin will want to show a CLOB on 'invoice spreads,' with one leg as the Libor swap and the other leg the Treasury futures" trading "as a package on Javelin and be cleared with the CME under the EFRP rules (or EFS, whichever is appropriate)."); [redacted], at '051 [redacted]

361. Documents from trueEX indicate that trueEX had plans to develop workflows for package transactions including butterflies, invoice spreads, swap spreads, and switches.[408] In June of 2014, Kumar Doraiswami of trueEX apparently believed that the platform would be able to offer swap spreads "soon."[409]

362. Professor Johannes discusses the case against a "swap portfolio maintenance/unwind package," which "involve trading or rebalancing an existing IRS portfolio."[410] Yet, Professor Johannes makes no mention of trueEX's Portfolio Terminations and Compactions ("PTC") tool, by which the company offered electronic execution of precisely those type of package transactions, as well as the functionality to execute new-risk package trades, by as early as April of 2014.[411] [redacted] [412] [redacted] [413] Professor Johannes'

[redacted]

[408] TRUEEX-IRS-4777344, at '345 (Jan. 17, 2014 email from L. Lynhiavu (ISDA) to B. Lynn (Global eMarkets) discussing slides presented by K. Bell (TrueEx), including Slide 7 which defined package transaction types and those that would be supported in the platform's workflow, including switch, swap spread, invoice spread, and butterfly transactions); Hirani Decl. ¶¶36-40.

[409] TRUEEX-IRS-5450177 (June 23, 2014 trueEX email in which K. Doraiswami wrote that "the swap spread trade is a secondary bond + swap and we will be doing this soon").

[410] Johannes Rep. ¶252.

[411] TrueEx-IRS-3647466, at '467 (April 10, 2014 email from H. Mahon, of trueEX, to A. Kumar (JPM) and J. Tierney (JPM) noting, "I see that we traded a package that was both a termination and a new risk trade outstanding!!"); Mahon Dep. Tr. (trueEX)210:11-23 (Mahon testified regarding TRUEEX-IRS-3647466, an email about a package trade: "Q. And am I right, though, that when you said 'I see that we traded a package,' you're saying to them that JPMorgan had done a package trade? A. Yes.").

[412] [redacted] at '518.

[413] [redacted]

analysis of the ability of anonymous all-to-all execution platforms to accommodate package transaction includes no examination of this PTC tool, nor whether its functionality could be adapted for other package trades.[414]

363. The MFA wrote to the CFTC about its concern that the CFTC might force package trade onto SEFs before SEFs were ready, *in the actual world,* to handle them.[415] The MFA's letter to the CFTC was written in the actual world, not in the but-for world in which SEFs would have been ready much earlier.

364. I agree with the MFA, in their comment to the CFTC,[416] that "the optimal way to build the foundation for a smoother market transition to mandatory SEF trading is to begin first with the outright (*i.e.* non-package) benchmark tenors, as they are the building blocks for a wide array of Package Transactions, followed by more complex Package Transactions, phased in as follows: [table omitted]." The MFA's phase-in table for packages shows an initial phase of benchmark swap spreads, followed 90 days later by non-benchmark swap spreads, curves and butterflies referencing non-benchmark swaps, and then, after another 90 days, a phase-in of unwind/offset packages, invoice spreads, and a range of other types of packages.

365. Based on my review of case evidence, it is reasonable to conclude that, in the but-for world, at least one of the SEF platforms would have developed the technology to offer execution services for a range of types of package transactions by early 2013.

366. The presentation by Professor Johannes of potential harm to buyside firms caused by the absence of AA2A package trade is inconsistent. In the discussion of this issue in Section IX of his report, Professor Johannes includes spreadovers, also known as swap spreads, among other forms of package trades, when he emphasizes the large total amount of package trade.[417] Of total package trade, the dominant form is spreadovers. A 2018

[redacted] at '949-'951 [redacted]

414 [redacted]

[415] Managed Funds Association Submission to CFTC, Re: Industry Filings IF 13-004, 13-005, and 13-007, November 21, 2013, https://comments.cftc.gov/PublicComments/ViewComment.aspx?id=59381.

[416] Managed Funds Association Submission to CFTC, Re: Industry Filings IF 13-004, 13-005, and 13-007, November 21, 2013, https://comments.cftc.gov/PublicComments/ViewComment.aspx?id=59381.

[417] Johannes Rep. ¶¶263-264.

analysis by Clarus[418] cited by Professor Johannes in another section of his report[419] shows that spreadovers account for "34% of total risk traded" (*both* package and non-package), on *all IRS SEFs*! Yet in this presentation of the potential for harm to buyside firms for package trades, Professor Johannes fails to connect with the point that he made much earlier in his report, that the buyside conducts essentially no spreadover trade.[420] Indeed, the same analysis by Clarus cited by Professor Johannes finds almost no buyside SEF trade of spreadovers. I do not understand why Professor Johannes included spreadovers in his discussion of the role of package trade for potential buyside harm in Section IX of his report, given that he was aware that buyside firms do little or no spreadover trading.

J. Dealer registration rules would not deter new AA2A IRS market makers

367. In my opening report, I explained that a transition to AA2A trading would yield an increase in IRS trading volumes. This increase in volumes is enhanced by the entry of principal trading firms (PTFs), which would have begun actively making markets in IRS, thus improving liquidity and attracting more trade volumes and more entrant firms.

368. In Professor Johannes' opinion, liquidity would not have been significantly enhanced by new high-frequency trading firms (HFTs) and PTFs because he believes that swap dealer registration requirements would have imposed prohibitive regulatory burdens on HFTs and PTFs, discouraging them from acting as swap dealers.[421] Non-dealer proprietary traders have operated under floor-trader exemptions[422] to dealer regulations. Professor Johannes argues that HFTs and PTFs were at risk of losing those exemptions (and thus having to comply with various requirements applicable to swap dealers) if they made markets in IRS. Dr. Johannes thus concludes that IRS trading volumes would not have been meaningfully increased by entrant market makers such as HFTs and PTFs.

369. However, this argument is refuted by real-world experience. Even in the actual world, and in particular despite actual dealer registration rules, firms such as Citadel did enter the IRS market as dealers. [redacted]

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[418] Chris Barnes, "USD Spreadovers and SEF Market Share," Clarus Financial Technology, August 14, 2018.

[419] Johannes Rep. ¶55.

[420] Johannes Rep. ¶55.

[421] Johannes Rep. ¶¶117-123.

[422] CFTC Letter No. 19-14, Re: No-Action Relief for Certain Conditions of the Floor Trader Provision, CFTC Division of Swap Dealer and Intermediary Oversight, June 27, 2019, p. 3 (The Division of Swap Dealer and Intermediary Oversight of the Commodity Futures Trading Commission "will not recommend that the Commission take an enforcement action against a Floor Trader that excludes its DCM and SEF Cleared Swaps when determining whether the Floor Trader is a swap dealer pursuant to paragraph (6)(iv) of the 'swap dealer' definition in Regulation 1.3 (and therefore excludes its DCM and SEF Cleared Swaps from counting toward its SD De Minimis Threshold).").

[redacted][423] [redacted]
[redacted][424] [redacted]
[redacted][425]

370. As predicted by the economic principles of competition, the result of Citadel's entry as a market maker was a reduction in bid-offer spreads, as I discuss in Section II.D. With AA2A trade, although dealer profit margins per trade would fall due to further competition, volumes would rise. The incentive for market makers to enter would remain. I discuss the equilibrium of dealer entry in my opening report.[426]

371. [redacted][427]

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[423] [redacted]; [redacted] Dep. Tr. 16:25 ([redacted]).

[424] TRUEEX-IRS-1725323 (March 28, 2014 email from M. Hoddy Mahon (TrueEx, Director of Sales and Marketing, Americas) to Shravan Sahdev (Citadel, Portfolio Manager) regarding Citadel streaming prices); *see also* [redacted], at '396 [redacted]

[425] TRUEEX-IRS-1725323.

[426] Duffie Rep. ¶181.

[427] [redacted] *See also* TERA_00008208 ("The dealers are doing everything in their power to slow down the process and proprietary trading firms and hedge funds that might step into the void have been idling on the sidelines waiting for the rules to crystalize. That being said, as the Risk Magazine article I've pasted below indicates, firms like Citadel and Virtu are starting to

372. [redacted][428]

373. [redacted][429]

374. By August 2015, the industry news service *Risk* reported that HTG Capital, Teza Technologies, and TransMarket Group had begun quoting IRS on ICAP, Tradition, and BGC's SEFs, following Citadel which had already become the fourth largest market maker by volume on Bloomberg as of the first quarter of 2015.[430]

375. This interest and entrant activity make clear that regulatory barriers are not the primary impediment to alternative liquidity providers moving into the IRS market. Moreover, CFTC rules are not cast in stone – they respond to costs imposed on market participants and changes in market conditions, as demonstrated by rule changes that the CFTC implemented in the actual world, and as recognized by Professor Johannes.[431] The but-for advent of AA2A trade is an obvious change in market conditions that would likely have stimulated CFTC rule changes that encouraged entry by additional new dealers.

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ramp up their efforts. I've been in touch with similar firms in the space and the reception now is quite different from a year ago. Perhaps it's the Floor trader exemption that allows firms to make markets in swaps without registering as a Swaps Dealer that has broken the log jam. Or perhaps there is a sense that this new regime is here to stay and that the rules, while still in a bit of flux, are essentially here to stay.") (cited by Professor Johannes in Appendix 14); JAV_01793892 ("We understand that some firms may currently be, in reliance on the CFTC's relief in no-action Letter 13-80, engaging in on-SEF dealing in one entity while doing any related off-exchange trading in another entity.") (cited by Professor Johannes in Appendix 14).

428 [redacted]

429 [redacted]

430 [redacted]

431 Johannes Rep. ¶122.

376. For example, Commissioner Dan M. Berkovitz issued a statement in support of relaxing the dealer registration rules, saying,

> *"Swap trading is highly concentrated. The five largest swap dealing banking institutions were party to 70% of all swaps and 80% of the total notional amount traded.[fn omitted] Expanding and diversifying the sources of liquidity should improve price discovery and the safety and resiliency of the swap markets. Many proprietary traders have indicated that they would like to act as market makers for swaps on electronic swap execution facilities ("SEFs") or designated contract markets ("DCMs").[fn omitted] These traders generally do not directly solicit customers in the manner of traditional swap dealers. To facilitate this type of market making on SEFs and DCMs, the Commission included a floor trader registration provision in the swap dealer registration rule as an alternative to full swap dealer registration.[fn omitted] I believe the floor trader registration category is appropriate for proprietary traders who provide liquidity on electronic trading platforms, but in so doing, do not act as traditional dealers by soliciting customers or negotiating swap terms other than price or quantity. The current floor trader rule has not worked as intended. Potential sources of liquidity have not entered into these markets due to concerns about the potential breadth of the restrictions in the current provision. Addressing the issues with the existing rule will diversify the available sources of liquidity beyond the few large bank dealers that dominate swap trading today."*[432]

377. Given official-sector views such as these, it is reasonable to conclude that, absent the alleged conspiracy, high regulatory hurdles to dealer entry to AA2A trading venues would have been resolved in the but-for world.

378. Professor Johannes suggests that low levels of IRS trade frequency observed in the actual world would have inhibited PTFs and HFTs, which trade at high frequency. This ignores the fact that CLOBs incite high frequency trading. For example, in the treasuries market for cash securities, volumes of CLOB trade of on-the-run treasuries is dominated by PTFs and is characterized by intense high-frequency trade. As I stated earlier in this report, PTFs actually account for the majority of trade on BrokerTec, by far the largest electronic trading platform for US treasuries.[433] The off-the-run treasuries market, on the other hand, is not based on CLOB trade, has low frequency, and does not involve much if any trade by PTFs. This natural separation would also apply in the IRS market. Some

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[432] Statement of Commissioner Dan M. Berkovitz in Support of the Staff No Action Letter Regarding Floor Traders, June 27, 2019, https://www.cftc.gov/PressRoom/SpeechesTestimony/berkovitzstatement062719.

[433] Michael Fleming, Bruce Mizrach, and Giang Ngyuen, "The Microstructure of a U.S. Treasury ECN: The BrokerTec Platform," *Journal of Financial Markets*, vol. 40 (2018), pp. 2-22.

benchmark IRS would be "on-the-run" and trade at high frequency on CLOBs with the provision of liquidity by PTFs. Other IRS would trade "off-the-run," either by other AA2A protocols or away from AA2A platforms, and would not receive liquidity from PTFs.

379. Professor Johannes cited my submission to the U.S. Treasury Department,[434] agreeing with me that PTFs specialize in small-size trades. From this, he suggests that PTFs would not handle the large trades that one observes in the actual-world IRS market. Again, he ignores the impact of CLOB trade, which generates an incentive to break large trades into small trades in order to reduce price impact. We know that PTFs are in fact able to handle the sizes of trades that are common in the CLOB market for U.S. treasuries, because, as I have already noted, PTFs generate over half of the trade volume in that market. Research[435] by Fleming and Ngyuen of the Federal Reserve Bank of New York shows that 99.5% marketable orders on BrokerTec's treasury CLOB are executed at the inside quotes. In other words, most of the trades are small trades.

380. Overall, based on the evidence that I have just described, it seems clear to me that the registration rules noted by Professor Johannes would not have prevented entry of new effective market makers, including new dealers and PTFs, in the but-for world of active anonymous all-to-all trade of IRS. Even in the actual world, Citadel and other alternative liquidity providers *did decide* to actively trade on D2C RFQ SEFs. Their participation with equal or greater volumes on AA2A trade platforms would have faced no additional registration costs or barriers.

V. CONCLUSION

381. For the reasons that I set forth here and in my opening report, absent the alleged blocking behavior of the Defendant dealers, there would have been significant anonymous all-to-all trade before 2013 of the four types of IRS products at issue in this case on one or more of the trade platforms operated by Javelin, Tera, trueEX and, as a result, on Bloomberg and existing inter-dealer-broker platforms. The four product classes at issue are ISDA-standardized plain-vanilla fixed-floating interest rate swaps, forward rate agreements, overnight index swaps, and single-currency basis swaps. Anonymous all-to-all trade of products within each of these four classes of IRS products was viable in the absence of the alleged blocking behavior of dealers and would have benefited all or nearly all buyside firms trading these and related products.

382. These trade platform operators had the expertise, capital, technology, and business initiative to offer active AA2A trade of these products. There is ample record evidence

[434] Darrell Duffie, "Submission in Response to U.S. Treasury Notice Seeking Public Comment on the Evolution of the Treasury Market Structure," Graduate School of Business, Stanford University, April, 2016.

[435] Michael Fleming and Giang Nguyen, "Order Flow Segmentation and the Role of Dark Trading in the Price Discovery of U.S. Treasury Securities," Federal Reserve Bank of New York Staff Reports, Staff Report No. 624, August 2013.

suggesting that in the but-for world at least one of them would have succeeded in doing so by 2013. Major dealers, if acting in their individual interests, would have had to offer quotes and access to their customers on these AA2A platforms in order to gain first-mover advantage and avoid disintermediation.

383. With active AA2A trade of these IRS products, all or nearly all buyside firms would have benefited from better price terms. Buyside firms would also have benefited even if they chose not to trade on AA2A platforms, because of the disciplining of dealer quotes caused by superior price transparency emanating from AA2A platforms and by the option of buyside firms to substitute with trades on AA2A platforms of the same or related products, whenever dealer quotes were not sufficiently attractive.

384. Neither the analysis nor the opinions expressed in the reports of the Defendant experts, Dr. Culp and Professor Johannes, have changed the opinions that I expressed in my opening report. The assertions of Dr. Culp and Professor Johannes concerning the viability of AA2A trade and its benefits to buyside firms suffer from the serious logical gaps that I have described in this reply report. In particular, the Defendant experts failed to incorporate in their analysis the benefits to buyside firms in the but-for world of having access to *both* customer-to-dealer requests for quotes and AA2A trade. The Defendant experts also conflated the trade activity and bid-offer spreads in the actual world with those that would have occurred in the but-for world. As a result, they significantly understate the viability of AA2A trade and the associated buyside benefits. I strongly disagree with their conclusions regarding the viability and buyside benefits of AA2A trade of these IRS products.

385. My research into the matters discussed in my opening report and in this report is ongoing. I reserve the right to modify or supplement my opinions as additional information becomes available.

October 1, 2019

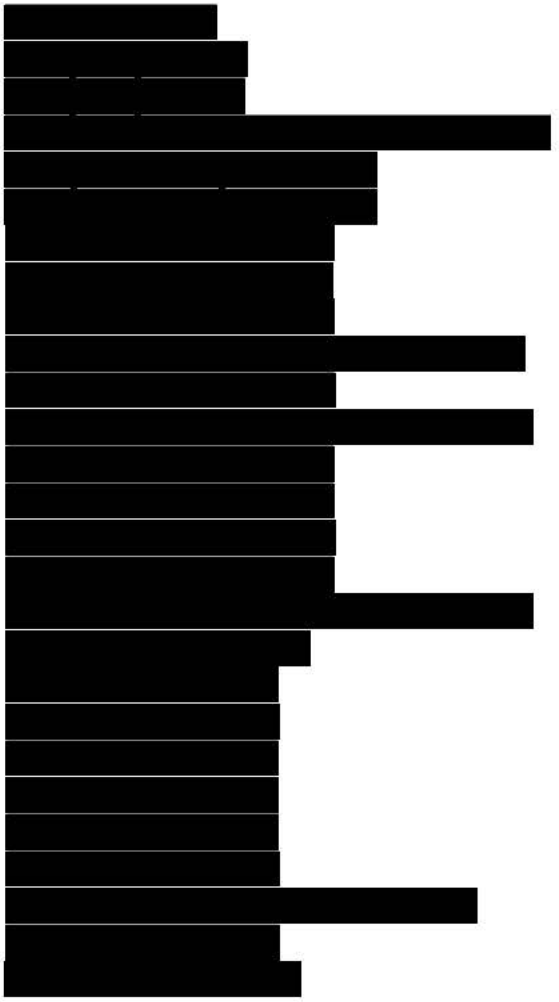
Professor Darrell Duffie — Date

APPENDIX A
DOCUMENTS RELIED UPON

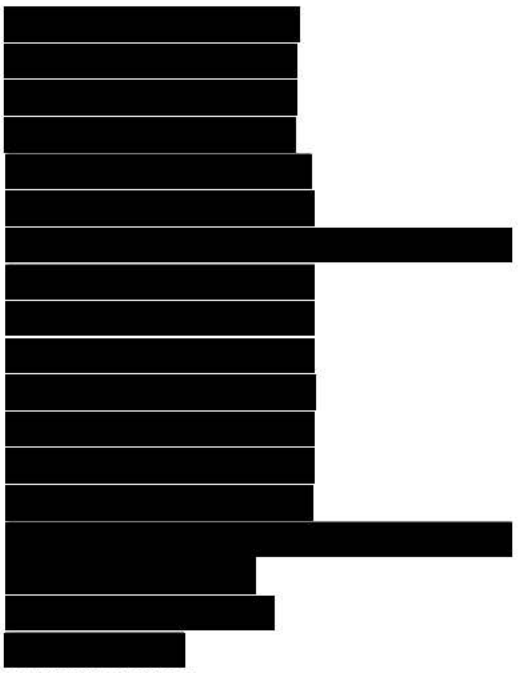
Reports and Declarations

Culp Report
Duffie Report
Hirani Declaration
Iqbal Declaration
Johannes Report
Martin Declaration
Neal Declaration

DOCUMENTS PRODUCED IN DISCOVERY[1]



[1] For convenience, only the first bates number in a multi-page document is listed.



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TRUEEX-IRS-4777344
TRUEEX-IRS-5037656
TRUEEX-IRS-5100518
TRUEEX-IRS-5163412
TRUEEX-IRS-5450177

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DOCUMENTS PRODUCED IN DISCOVERY (NO BATES STAMP AVAILABLE)

DEPOSITION TRANSCRIPTS AND EXHIBITS

[redacted] Deposition
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[redacted] Deposition
[redacted] Deposition
Colucci Deposition
Culp Deposition
[redacted] Deposition
[redacted] Deposition
Doraiswami Deposition
Duffie Deposition
Feda Deposition
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Hirani Deposition
Iqbal Deposition
Johannes Deposition
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Martin Deposition
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Neal Deposition
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Nuara Deposition
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Data

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